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ON

MEDICINE, NEUROLOGY, SURGERY, THERAPEUTICS, OBSTETRICS, PÆDIATRICS, PATHOLOGY, DERMATOLOGY, DISEASES OF THE EYE, EAR, NOSE, AND THROAT, AND OTHER TOPICS OF INTEREST TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION THROUGHOUT THE WORLD

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Therapeutics

ON THE TREATMENT OF DIABETES MELLITUS.[1]

CLINICAL LECTURE DELIVERED AT THE MEDICAL DEPARTMENT OF THE MEDICAL FACULTY AT LYONS.

BY PROFESSOR R. LÉPINE,

Professor of Clinical Medicine and Medical Pathology at the University of Lyons (France) and Member of the Academy of Medicine in Paris.

GENTLEMEN,—I wish to-day to speak to you on the treatment of diabetes mellitus, one of the most important and common diseases with which you will have to deal in your medical career. Great differences exist among diabetic patients: some of them are fat and others are thin; some suffer from albuminuria and others from acetonuria, etc. Above all, from a practical point of view, we have to distinguish diabetic cases from each other by the presence or the absence of aceto-acetic acid. As long as there is no aceto-acetic acid in the urine we may content ourselves with trying to remove the glycosuria, either by an appropriate dietetic regimen or by means of medicinal agents. On the contrary, when there is aceto-acetic acid in the urine, the glycosuria becomes of secondary importance, and we must, above all, endeavor to make the diaceturia (the presence of aceto-acetic acid in the urine) disappear, because it is the sign of the acid dyscrasia, which often leads to diabetic coma.

The presence of diaceturia may easily be detected by pouring drop by drop a solution of perchloride of iron into the diabetic urine. If, besides the precipitation of the phosphates, a dark-red color is produced, and if the patient is not taking any medicament which could give origin to such a coloration of the urine, one can

[1] Translated by Léon Lebovici, M.D. (Vienna), of Carlsbad.

affirm that it contains aceto-acetic acid. This is Gerhardt's test, which is of sufficient accuracy for practical requirements; it can be particularly recommended, though, unfortunately, it is in most cases neglected.

In my opinion, diabetic patients should, from the point of view of prognosis and treatment, be classed as follows:

I.—Diabetic patients whose urine does not contain aceto-acetic acid.	(*a*) Those whose glycosuria disappears after a strict dietetic regimen. (*b*) Those whose glycosuria is only diminished by this regimen.
II.—Diabetic patients whose urine contains aceto-acetic acid.	(*a*) Those whose glycosuria disappears after appropriate treatment. (*b*) Those whose glycosuria persists in spite of any treatment (the prognosis being almost invariably fatal).

I.—THE TREATMENT OF DIABETIC PATIENTS WHOSE URINE DOES NOT CONTAIN ACETO-ACETIC ACID.

(*a*) *Diabetic Patients whose Glycosuria disappears under the Influence of a Strict Dietetic Regimen.*—The first thing to do is to subject the patient, at least during three days, to a dietetic regimen consisting exclusively of albuminoids and fats,—*i.e.,* the various kinds of meat, fish, cheese, cream, eggs, and nuts. Though some of these substances—*e.g.,* cream—are not quite free from carbohydrates, they contain so little of them that we may fairly neglect the amount of sugar which they convey into the economy. This dietetic test, however, is of value only if we direct due attention to the *quantity* of food taken daily. The diet to be ordered must be sufficient to maintain the equilibrium of the nitrogenous substances; for, if a regimen of inanition is most effective against the glycosuria, it has also the great fault of not being practical.

Again, an excess of albuminoid substances would be equally disadvantageous. It is, therefore, necessary that the nutrition should be *just* sufficient, and in determining the right quantity of food we should take into consideration the weight of the patient, whether he be fat or lean, the extent of the surface of his body, his age, and the quantity of nitrogen which he usually excretes. For this reason, it is useful to observe him for a time, while he follows his customary diet, before prescribing antidiabetic regimen. If under improved nutrition the glycosuria disappears and there

be no complication, we may in most cases make a good prognosis. Hence the essential part of treatment in such a case will be dietetic, attention being, of course, directed to the eventual diathetic condition. It is clear that an arthritic patient should not be subjected (except in the initial test) to a meat regimen, and we shall have to prescribe for him a mixed, but *not too rich,* diet. A mild milk regimen will often be found very useful. Even when in a light case of diabetes the patient is not arthritic, he need not, as a rule, be kept for a long time on a very strict diet, for in most cases it would be useless. If owing to the strict antidiabetic diet the patient excretes no sugar for some weeks, his faculty of assimilating carbohydrates will increase, and finally we shall be able by successive trials to determine what *quantity* and what *quality* of carbohydrates he may take without harm.

The tables which indicate the composition of foods as to albuminoids, fats, and carbohydrates, though of some use to us, are of very limited value, (1) because we are never sure that a given food which the patient takes has the same composition as that which was analyzed some years before, (2) because from the point of view of *utilization* one hundred grammes of a given carbohydrate are very different from the same quantity of another carbohydrate, (3) because, even when we know in a general way that a certain carbohydrate is fairly well utilized, we cannot therefrom *with certainty* infer that it will be the same with our patient, as every individual has his own coefficient not only with reference to the quantity but also with regard to the quality of the carbohydrates which he can bear; moreover, this coefficient is not constant for the same individual at different times. For these reasons, the diabetic patient has to be permanently watched and guided by his physician.

(*b*) *Diabetic Patients whose Glycosuria is only diminished by the Regimen.*—Here the treatment is more difficult, because, even with a strict regimen, we can reduce the glycosuria only to an insufficient extent. We are also inclined to insist too much on a meat diet; but I do not hesitate to say that such a practice is bad, for the abuse of proteid substances has several disadvantages. One of these disadvantages is that it irritates the kidneys and increases the albuminuria, a second is that it favors the development of the acid dyscrasia, and a third, which is less known, is that it increases the proportion of the glycosuria itself, as I have shown on previous

occasions, after the communications on this subject by Külz, Naunyn, etc. Recently, Lenné has again insisted on this point, and he has even fixed a *limit* for the quantity of the albuminoid bodies to be taken each day, which is one hundred and two centigrammes of dry albumin for each kilogramme of the bodily weight. This limit, however, is arbitrary, as some diabetic patients can bear without any serious harm a little more than one hundred and two centigrammes of albumin daily, and there are others to whom this quantity would be injurious.

Heretofore the increase of the glycosuria after an excess in the meat diet has been explained by the increase of the production of sugar at the expense of the proteid substances; but very recently Talma has given another explanation of this fact, stating that the irritation of the kidneys owing to an exaggerated excretion of nitrogenous matter cannot only increase the albuminuria, but also render the kidneys more easily permeable for the passage of sugar. The increased permeability of the kidneys for sugar, under certain conditions, is an undeniable fact. It is beyond any doubt that we shall henceforth have to admit the existence of a *renal element* in diabetes mellitus. In other words, if two individuals have the same degree of hyperglycæmia while their kidneys are not permeable to the same extent, the urine of one of them will contain more sugar than that of the other. This is what clinical observation teaches us every day, what I have repeatedly observed in my experiments on the dog bearing on pancreatic diabetes, and what Ellinger and Seelig recently observed when they artificially produced nephritis in a dog from which they had extirpated the pancreas.

It is not proved, however, that the elimination of an excess of nitrogenous matter renders the kidney more permeable for sugar and that it thus gives origin to a glycosuria without hyperglycæmia. Talma's opinion to that effect was based on the fact that he had observed in the same cases albuminuria, glycosuria, and a copious sediment consisting of oxalate of calcium and urate of sodium, besides uratic or hyaline casts of a *renal origin*. But the coincidence of an albuminuria with casts and of a glycosuria cannot, in my opinion, prove the renal origin of the latter.

However that may be, it is necessary to restrain the quantities of the albuminoids in such cases. It has been recommended that

they be replaced to some extent by fats, which scarcely give origin to sugar fermentation. But we cannot give large quantities of fats, because of the patient's repugnance to them and also because much fat may, according to the statements of Geelmuyden and other authors, sometimes produce an acid dyscrasia. We must not thus commit an excess in any respect, but give the patient just what is necessary for him of albuminoids (to maintain the equilibrium of the nitrogenous matter) and of fat (in order to furnish the number of calories which are indispensable for him with respect to his bodily weight, his age, etc.), and try to reduce the glycosuria by means of muscular exercise, provided that this does not fatigue the patient, and by the aid of some medicaments.

We have two kinds of remedies at our disposal in this case,—viz.: (1) those which encourage the glycolysis and (2) those which diminish the glycogenesis. The first mentioned are particularly indicated for fat diabetic patients. These medicaments consist of alkalies in moderate doses as well as alkaline mineral waters; also permanganate of potassium in doses of from one to two decigrammes a day, dissolved in water or wine. Drugs which diminish the glycogenesis include antipyrin,—of which some years ago I furnished experimental proof that it checks the transformation of glycogen into sugar,—in doses of from two to three grammes a day, quinine, opium, and sometimes, but only in cases of nervous diabetes, bromide of potassium. Arsenic and particularly cacodylate of sodium, given subcutaneously, are useful in those cases requiring treatment to aid the general nutrition.

As to other medicinal agents which have been recommended for diabetes mellitus, I do not deny that they may have proved useful occasionally, but I think only exceptionally, and their use does not seem to me advisable. Thus, the glycosuria improved under the use of the salts of uranium, but these are dangerous poisons, except in very small doses.

II.—THE TREATMENT OF DIABETIC PATIENTS WHOSE URINE CONTAINS ACETO-ACETIC ACID.

While there are many patients who excrete in their urine *small* quantities of acetone without any noteworthy amount of aceto-acetic acid, in my experience there are none who excrete aceto-acetic acid and do not at the same time also excrete acetone. In

most cases, if not always, the patients who excrete aceto-acetic acid have also beta-oxybutyric acid in their urine.

It would greatly facilitate clearness of language to designate by a special term those diabetic patients who are affected with acid dyscrasia. The word "acetonurics" is not quite satisfactory, because there may be acetonuric patients without an acid dyscrasia. I, therefore, propose the name "*diaceturics,*" on account of the presence of aceto-acetic acid in the urine.

There is still much uncertainty as to the origin of these abnormal substances in the human economy. It was thought some years ago that the albuminoid bodies were the only source of them, and for that reason there was, in the case of diaceturic patients, the indication of restricting the quantity of albuminoid bodies in the diet. We have, however, more and more become inclined to look upon the fats as a very important source of the oxybutyric acid and its derivatives, aceto-acetic acid and acetone; hence the new indication of diminishing the quantity of fatty food taken by diaceturic diabetic patients. This is not wholly theoretical: I am at present attending a young diabetic patient who is diaceturic to a high degree; the use of cream increases quite distinctly the quantity of aceto-acetic acid in his urine. As to the notion that the fat of beef or mutton produces a less acid dyscrasia than the fat of vegetable substances, and even than butter, I have not as yet formed a decided opinion.

Although in the case of certain diabetic patients a diaceturia, even an intense one, may persist for months without any apparent damage to the patient, we should endeavor by all means to make this severe complication disappear. The result of the treatment will enable us, as before stated, to establish, from the prognostic point of view, two classes of diaceturic patients,—viz., those in whom the acid dyscrasia diminishes much or disappears even completely, and those in whom the treatment is quite inefficacious.

The use of large quantities of carbohydrates is often followed by a diminution of the diaceturia. This is an important result, but it is not entirely satisfactory, because the glycosuria is thus, unfortunately, increased. A carbohydrate which would be available for diabetics is much to be desired. Several physicians have administered to their diabetic patients, without any harm, from twenty-five to one hundred grammes of levulose; this is undoubtedly much

better utilized by the diabetic organism than glycose if the liver be in a healthy condition. Unfortunately, pure levulose is rather costly. In some cases we shall be obliged to use saccharose, which, owing to its becoming decomposed in the intestine, furnishes half its weight of levulose. In fact, I could prove by clinical experience that fifty grammes of saccharose, when given to *certain* diabetic patients are less obnoxious than the same weight of starch.

Certain vegetables and fruits contain some kinds of sugar which are still but little known, and which are to some extent utilized by diabetic patients. We must not, therefore, absolutely prohibit their use in diabetes, particularly in cases of diaceturia. Although by permitting our patient to indulge in these articles of food we may increase the glycosuria, this disadvantage is more than compensated for by the diminution in the coexisting diaceturia. In every case of diaceturia we must by means of a daily analysis of the urine carefully watch the effect of the various kinds of food which the patient is taking.

According to Schwarz, gluconic acid, which is an oxidation product of glucose, diminishes the diaceturia better than glucose. If this fact should become definitely established, we should be able by the administration of gluconic acid to remedy the insufficiency of the destruction of glucose in the economy of diabetic patients. Meanwhile we shall have to resort to the use of bicarbonate of sodium in very large doses, this being a medication which has often, at least temporarily, proved useful, and which has even saved the lives of several patients.

GERSUNY'S METHOD OF PROTHESIS BY SUBCUTANEOUS AND SUBMUCOUS INJECTIONS OF VASELINE.

BY R. ROMME, M.D.,

Of Paris.

At the recent surgical congress held in Paris Delangre reported several cases in which he had recourse, with success, to Gersuny's method of hypodermic injections of vaseline. He first tried it on himself, in order to raise up a depression caused by a scar due to a boil. As the result was very satisfactory in every way, he used the injections in a woman who had been operated on for fibroma of the breast, and in whom he thus corrected the deformity caused by removal of the mammary gland. This woman died seven months later, and he was able at the post-mortem to verify the fact that the vaseline injected beneath the skin of the breast had remained in place.

This method of subcutaneous prothesis is but little known in our country; yet the simplicity of the process and the daily service which it may render make it an intervention which ought to interest the practitioner from a number of points of view. We have now in our possession sufficient clinical and experimental data on this subject to enable us to speak of it with confidence.

Gersuny's method of prothesis consists, in the main, in injecting beneath the skin, mucous membranes, or into a natural cavity, paraffin, known also by the name of medicinal white vaseline, the melting point of which is higher than the temperature of the body. The paraffin used by Gersuny melts at a temperature that ranges between 104° and 108° F. In order to inject it into the tissues it must first be liquefied by the heat of a lamp; once injected it soon becomes a solid body deposited in the substance of the tissues. The importance of knowing what will be the ultimate fate of this foreign body is at once manifest, in order to estimate the definite value of this method of prothesis.

In order to settle this question we have at our disposal the experimental researches of Juckuff and the more recent ones of Moskowicz and Stein.

The researches made by Juckuff on rabbits, guinea-pigs, and pigeons consisted in injecting beneath the skin of these animals a mixture of liquid and solid paraffin whose melting point ranged between 88° and 96° F. When the animals were killed, after a greater or less lapse of time, he found that the vaseline injected was surrounded and traversed by newly formed connective tissue, constituting a sort of reticulum whose cavities were filled with an emulsion of vaseline. This condition of emulsion only occurs a long time after the injection, and favors the resorption of the vaseline. At any rate, in a rabbit which had received an injection of eight cubic centimetres of vaseline colored by chlorophyl he was able after seventy-five days to find particles of green vaseline in the animal's lymphatic ganglia.

During these experiments Juckuff also observed that the vaseline injected, obeying the laws of gravity, accomplished a sort of migration by following the subcutaneous connective tissue and that of the muscular sheaths, and thus penetrated into the subpleural and subperitoneal spaces.

This migration of the vaseline injected beneath the skin is denied, or rather differently interpreted, by Professor Gersuny's assistant, Moskowicz. He thinks that the migration of the vaseline should be explained, in the first place, by the large amount of vaseline in proportion to the animal's weight which Juckuff used in his experiments; in the second place, rabbits and guinea-pigs have a free skin, and this skin, furthermore, has powerful muscles, whose contraction must have played the principal *rôle* in this migration.

The experiments made by Moskowicz on rabbits enabled him to observe for himself the formation around the vaseline injected of a sort of reticulum of newly formed connective tissue. From the clinical facts that he was able to elicit in Professor Gersuny's wards he is led to think that this reaction of the subcutaneous connective tissue is even more marked in man than in animals.

In a word, the experiments of Juckuff and Moskowicz, as well as those of Stein, which gave the same results, show that vaseline injected beneath the skin gives rise to a process of reaction leading to the formation of a connective neoplasm which imprisons the

vaseline and thus insures the duration of the plastic result. As to the ultimate resorption of the vaseline, this question is not yet definitely settled, as the experiments undertaken on this point by Moskowicz and Stein are not yet completed.

Two other points, which it was also necessary to elucidate, concern the toxicity of the vaseline injected and the possibility of pulmonary embolus due to the injections.

As regards the first point, the researches of Meyer, as well as those of Stein, enable us to say that vaseline injected beneath the skin does not give rise to signs of intoxication. Stein injected beneath the skin of mice as much as five grammes of vaseline, which is equal to a third of the animal's weight, without noticing the least toxic symptom. This was also the case in experiments made with larger animals, such as dogs, cats, and rabbits. From this we may conclude that in man, with whom in proportion to his weight only minute quantities of vaseline are injected, this substance may be looked upon as harmless.

As regards the possibility of embolus, the case is not quite the same. Stein, who has examined this question, makes the judicious remark that injections of vaseline may be compared to injections of mercurial salts suspended in an oily liquid. Now, with the latter when made beneath the skin embolus is very rare; thus, Neisser observed one case in eight hundred injections of mercury, and Epstein seven very light cases in eight thousand two hundred and ninety-two injections. At any rate, the possibility of embolus has not led to the abandonment of subcutaneous injections of mercury, and there does not seem to be any reason why the case should not be the same for these subcutaneous or submucous injections.

It should, however, be mentioned that Pfannenstiel has published a case of pulmonary embolus in a woman in whom he injected vaseline around a vesico-vaginal fistula. In his opinion the accident was certainly due to the vaseline; but Moskowicz believes that in this case an error of technic was committed, which is accountable for the occurrence. The vaseline was injected while it was still quite hot, and Moskowicz questions whether this hot liquid did not produce thrombosis by coagulation in a subcutaneous vein, which thrombosis afterwards gave rise to embolus. However this may be, the case is unique, so far, and embolus has never been observed in the experiments on animals made by Moskowicz and by Stein.

Before passing on to the therapeutic indications of Gersuny's method, we must give in a few words the operative technic; as has been said above, it is very simple.

The vaseline used for these injections, while medicinal vaseline, should melt at a temperature of between 104° and 106° F., and when left in the temperature of an ordinary room should have about the consistency of any salve. It is, of course, necessary to sterilize it before use, which can be done either by simple boiling or by leaving it in a bacteriological oven at a temperature of 390° F.; once sterilized, it should be poured into little bottles having a large mouth, and it will then set. Before being used the bottle must be placed in hot water, and when the vaseline is again liquid it can be drawn up with a Pravaz syringe. The needle should then be placed on the syringe, and, when the vaseline has cooled off a little and comes through the needle in the shape of a thread, it can be injected beneath the skin or a mucous membrane according to the usual technic of hypodermic injections. As soon as the injection is made, the region should be sprayed with chloride of ethyl, so that the mass injected will solidify more rapidly; all that then remains to do is to mould it in conformity with the result desired.

It is seldom necessary to inject more than two or three divisions of the syringe at one time. When a new injection is necessary, care should be taken to make it at the side of or beneath the mass first injected. No dressing, with the exception of obturating the prick with some adhesive plaster, is necessary.

It is, of course, understood that the greatest cleanliness must be used. To lessen the pain a hypodermic or intradermic injection of cocaine may precede the injection of vaseline. The operative sequelæ are very slight,—nothing more than a little œdema of the region, which disappears in twenty-four hours.

In order to make clear the therapeutic indications of Gersuny's method there will be no better way than to pass rapidly in review some typical cases in which it has been used. There are now about fifty cases known of vaseline prothesis in various parts of the body.

Gersuny's first case was that of a young man who had had to undergo castration for tuberculosis of the testicles and was about to appear before the medical board for service in the army. As he was much mortified by this mutilation, he consulted Gersuny, who proposed to him to replace the absent testicles by vaseline. To

accomplish this he injected in several sittings twelve cubic centimetres of vaseline in the right part of the scrotum and ten in the left. He saw the patient again eight months later, and found that the artificial testicles were still in place, and gave the sensation of small tumors of a cartilaginous consistency; these foreign bodies were perfectly well tolerated and gave no trouble. During the course of the following year the patient was seen on several occasions, but the result was found not to have changed in any way.

Encouraged by this success, Gersuny used the injections in a case of incontinence of urine in a woman whose urethra had been entirely destroyed by an ulceration, which had also affected the neck of the bladder, leaving an orifice there through which the little finger could be passed. Gersuny began by making a series of injections of vaseline in the prolapsed flaps of the mucous membrane, and then pushed them back into the bladder where they formed a species of valve; then, to prevent their coming out again, he injected a little vaseline around the opening in the bladder. This case was completely successful, and the patient has been able to control the passage of her urine for two years.

Another very similar case was treated by another surgeon in a woman with whom incontinence of urine was due to dilatation of the urethra. In this case the surgeon simply injected beneath the mucous membrane of the neck of the bladder eight cubic centimetres of vaseline and made a sort of artificial prostate gland, which opposed the flow of urine except when the bladder contracted.

The cases published by Halban are quite as interesting as the foregoing. In a case of prolapsus of the uterus in a woman of sixty that was beyond the reach of operation, he first put the uterus back into place and then injected into the parametrium, on each side of the cervix, eight cubic centimetres of vaseline. On examining the patient a week later he found that the vaseline injected formed two solid bands which held the uterus in position. This result had held good for eight months when he published the case. A similar operation (injection of ten cubic centimetres of vaseline beneath the anterior and posterior walls of the vagina) was performed by Halban, with equal success, in a case of prolapsus of the vagina in a woman of sixty who had undergone hysterectomy for cancer.

The same degree of success has been obtained in a case of complete incontinence of fecal matter in a man in whom the existence

of several fistulæ of the anus had necessitated the section of the sphincter muscle; when the wound healed, in spite of several complementary operations, the sphincter was found to have lost its power of contraction. To relieve this state of affairs, Gersuny injected at different times thirty cubic centimetres of vaseline beneath the skin around the sphincter, using from eight to ten cubic centimetres at a dose. Power to retain fecal matter became so complete that the patient could only evacuate the bowels by the aid of an enema. Gersuny has treated two other cases with success by the same method.

The three cases of voluminous hernia treated by Gersuny by injections of vaseline in patients who declined to undergo operation are particularly interesting. Here is the history of one of them.

A man of seventy-nine was suffering from a large hernia of the scrotum that was kept in place with great difficulty by a bandage. On three different occasions this rupture showed signs of strangulation, which always yielded to taxis, but the patient persistently refused to undergo operation. To prevent the return of these symptoms of strangulation, Gersuny had recourse to injections of vaseline, and in a single sitting injected two cubic centimetres against the pubis and twenty-eight around the external inguinal orifice between the anterior and posterior walls of the canal. Immediately after the injections, which were made with the finger inserted into the canal as a guide pushing before it the skin of the scrotum, the orifice, which before had admitted four fingers easily, would scarcely admit the extremity of the forefinger. The patient then put on his bandage and left the hospital. He has since been seen on several occasions, but the hernia no longer descends into the scrotum and the result has remained perfect.

The operations that we have mentioned above require a certain skill, and may be counted among the difficult ones, particularly if we compare them with those made on the face and mouth, which constitute the real, every-day indications of Gersuny's method.

It is difficult to realize without actual experience with the method how easily a depressed scar of the face can be raised, as was done by Delangre, or a broken or deformed nose can be rendered presentable again. All that is necessary is to make a fold in the skin on the top of the nose, inject a quarter of a cubic centimetre of vaseline beneath it, and mould it into any shape you wish. The

plastic and æsthetic results obtained in this way are really extraordinary, to judge by the photographs given in the publications of Moskowicz and Stein.

It is also easy to see what a resource the hypodermic injections of vaseline will be in cases where a disease of the bone has necessitated the resection of a maxilla, mastoid process, or cheek-bone. In all these cases prothesis may aim at obtaining either an æsthetic effect or the correction of a condition resulting from a retracting cicatrix. Thus, in a case of resection of the upper maxilla for cancer, where it had been necessary to cover the loss of substance in the palate with the mucous membrane of the cheek, retraction of the scar had produced ectropion of the lower eyelid. By a series of injections of vaseline, Gersuny forced back the cheek that had been drawn towards the cavity of the mouth, and the ectropion disappeared.

The operative technic is not more difficult in the cavity of the mouth,—for instance, in fistulæ which sometimes occur after suture of the soft palate or palate proper, performed for congenital malformations of those regions. Thus, in a case of this sort in which after the operation there had remained a fistula between the nose and the mouth, the surgeon was able to obliterate the orifice by injecting three cubic centimetres of vaseline into its walls. In a similar case, in which the patient had been left after an operation for cleft palate with a marked defect in pronunciation, due to the fact that during phonation the uvula, which was too short, did not play its proper *rôle* in the pharynx, Gersuny remedied this condition by a series of injections of vaseline made beneath the uvula as well as beneath the mucous membrane of the pharynx. This prothesis, which was intended to bring nearer together the pharynx and the soft palate, succeeded, and the defect in pronunciation disappeared.

These are the successful cases that Gersuny's method, which is as yet hardly two years old, can already lay claim to. Its indications, as may be seen by the instances cited above, have been steadily extended. Thus, quite recently Rohmer and Gersuny have had recourse to injections of vaseline into the cicatrix of the conjunctiva to furnish a solid foundation for a glass eye placed in the orbit after the removal of the globe itself. In a publication on prothesis by means of vaseline, Moskowicz, from whom we have taken the majority of these cases, suggests by this means the correction of the retraction of the thorax that follows resection of the ribs.

TREATMENT OF BLADDER AND RECTAL TROUBLES IN NERVOUS DISEASES.

CLINICAL LESSON AT THE ROYAL MEDICAL CLINIC OF ERLANGEN, PROFESSOR STRÜMPEL'S DEPARTMENT.

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GENTLEMEN,—In many nervous diseases one of the most important complications is the disturbance of the patient's well-being by faulty and incomplete evacuation of the bladder and the rectum. Not a few patients suffering from severe nervous disease would be reasonably comfortable, even though bedridden, except for the fact that their lack of control over the bladder and rectum makes life miserable. While it is usually thought that we know the physiology and the nervous innervation of these viscera, as a matter of fact what little we know as to the nervous centres which rule over the bladder, the rectum, and the genital apparatus is rather indefinite and is always stated in practically the same terms in the textbooks on physiology and in the writings on neurology, so that there is more than a suspicion that what were at first mere theories in the matter are now taught as facts.

Undoubtedly, if a careful study of cases of disturbance of the urinary and rectal functions in serious diseases of the central nervous system could bring us to a more hopeful attitude with regard to the necessity for such patients requiring to be catheterized and lacking control over their fæces for the rest of their lives, much good would be accomplished. I think that a study of the cases at present in the clinic, together with some conclusions from experimental observations made upon animals, will show that our present teaching with regard to the innervation and disturbance of function of the bladder and rectum are at fault, and that there is an automatic provision of nature which makes the outlook for these patients much better than has been imagined.

It is well known that in transverse lesions of the spinal cord

certain disturbances of the bladder and rectum occur. These happen only when there is extensive or complete interruption of the spinal nervous paths. At first the patient complains of difficulty in urination and then of the entire impossibility of voiding urine voluntarily. Usually there develops the clinical picture of paradoxical retention of urine. The bladder is distended and may reach as high as the navel. In spite of the efforts of the patient and the use of the abdominal muscles or even auxiliary pressure, the urine cannot be passed, or is passed in very small amounts. Practically the same set of symptoms is noted with regard to rectal evacuation.

In the progressive course of the affection of the spine, usually as the result of attempts at catheterizing the patient for the relief of urinary retention, cystitis is set up. This affection seems to occur rather easily because of the disturbed innervation of the bladder and the impossibility of emptying it completely as in the normal state. After a while there comes the second stage of urinary disturbance. At longer or shorter intervals urine finds its way out of the bladder without the patient being able to prevent it and often without his feeling it. This condition is called paralysis of the bladder, though the name is a bad one, for this viscus is not paralyzed, but on the contrary acts entirely of itself and without the influence of the patient's will. It is easy to understand that in certain cases paralysis of the bladder may be presumed to exist because whenever the patients are examined they are found to be wet. Careful examination, however, will show that there is not a continuous leakage of urine in this stage, as so often happens in the primary stage of paradoxical retention. The urine is always forced out of the bladder at longer or shorter intervals in amounts that are usually about the same. In order to substantiate this declaration as to the automatic passage of urine I shall show you some patients and give you their histories.

The first patient to whom I shall call your attention this morning is a carpenter from a neighboring village, who has been here in the clinic for over a year. He suffered some years ago from pleurisy and from a set of enlarged cervical glands which suppurated and had to be operated upon. About five months before the patient came to the hospital he had severe pains in the back of the neck. He noticed too that he grew tired very quickly and that his gait was unsteady and his legs stiff. Two months later he had to take

to his bed from sheer inability to use his legs. Practically complete paralysis had developed. At present his power to use his lower extremities is extremely limited. It is only with the greatest effort that the patient is able to draw his legs up once or twice, when he becomes so fatigued that he cannot make the slightest movement with them.

An examination of his spine shows at once the condition that is present. His second dorsal vertebra is rather prominent and is very tender to pressure. His intercostal muscles are completely paralyzed. The patient is able to breathe only by means of his diaphragm and by the aid of the accessory muscles of respiration in his neck. Breathing is, moreover, a constant effort for him. From the level of the third rib there is distinct loss of feeling over the whole body. The tendon-reflexes in the lower extremities are all very lively. As you can see, even a slight touch on the patellar tendon causes a marked knee-jerk. It is not difficult to demonstrate the existence of ankle-clonus on both sides. The Babinski reflex—that is, the dorsal flexion of the big toe when the sole of the foot is tickled gently—is also present. Considerable attention has of late been called to this symptom and we have here a typical example of it.

With regard to the early disturbance of his urinary function we have no very definite details in the history. It is difficult to find out just when urinary troubles begin. Since the patient has been in the clinic we have observed that the bladder empties itself four or five times during the day,—that is, every two or three hours. This vesical evacuation is entirely spontaneous and independent of the patient's will. A short time before urination begins he has a certain indefinite sensation in the bladder region,—that is, over and behind the symphysis pubis; a few seconds later the urine finds its way out in a rather strong stream. Three or four times during the course of such an evacuation the stream ceases for a moment or two and then begins of itself again. In the intervals between these spontaneous micturitions there is never any urinary leakage. The urine does not come away by a continuous trickling, as is so often said to be the case when vesical paralysis has led to over-distention of the bladder and to consequent mechanical overflow from retention.

On a number of days I have had the exact quantity passed at

each urination measured. I have arranged these measurements in parallel columns for purposes of comparison, and have been rather surprised to find that it is practically always at the moment when a certain amount of urine has gathered that the spontaneous evacuation reaction is aroused and the bladder empties itself. As can be seen, the amounts passed at each urination are nearly the same. For instance, at 8.30 A.M. he voided two hundred and fifty cubic centimetres, at 11 A.M. two hundred and seventy cubic centimetres, at 2.15 P.M. two hundred cubic centimetres, at 4.30 P.M. two hundred and ten cubic centimetres, and at 6 P.M. two hundred cubic centimetres. The amounts passed usually varied between two hundred and two hundred and fifty cubic centimetres. On a number of occasions, immediately after this involuntary evacuation of the bladder I have had the patient catheterized. As a rule, I have found that about two hundred cubic centimetres of urine remained in the bladder after the end of the spontaneous urination. It was possible to obtain this residual urine, however, only when considerable pressure was exercised above the symphysis pubis or when the catheter acted as a siphon for drainage.

In this patient the desire to defecate asserts itself quite as unexpectedly as the urination. If he does not take precautions as soon as the first feeling of approaching defecation is noticed, he is entirely unable to retain the fecal material and the stool is passed in bed. As a rule, the patient is quite constipated and has a stool only after a purgative has been administered. It is a very noteworthy fact, however, and one that deserves careful attention when we consider his condition, that at the time of rectal evacuation the urine is never passed, and there seems to be no sympathy between the evacuation of the bladder and rectum.

The patient is unable to retain flatus, and it has been a source of great annoyance to him that even during the course of an examination such as we are now engaged in flatus escapes with a loud noise. He has learned, however, that we realize his helplessness in this condition and he has become less sensitive to the annoyance of it. The patient is unable to retain rectal injections. These escape from him usually a short time after they are given and practically without any possibility of control on his part. The patient's sexual functions are, as might be expected, entirely suspended: there has been no erection or ejaculation for many months.

This patient, then, who is suffering from a tuberculous osteitis of the body of the second dorsal vertebra, has lost all voluntary command over fecal and urinary evacuation, as the result of the extreme compression to which his spinal cord is subjected in the upper dorsal region because of the presence of inflammatory products within the spinal canal. With regard to urinary and fecal evacuations, however, it does not seem proper to say that paralysis of the bladder or of the ampulla of the rectum exists. The evacuation of the bladder or the rectum takes place entirely automatically whenever a certain degree of fulness of either of these hollow viscera exists. A short time before evacuation takes place the patient has a distinct preliminary sensation in the vesical or rectal region. Observations show that with regard to urinary evacuation this period of warning is at least twenty seconds, and there is even a little more warning for rectal evacuation, so that the patient has, as a rule, quite sufficient time to take the necessary precautions to avoid soiling of the bedclothes.

In women who suffer from transverse lesions of the spinal cord it is not so easy to study the spontaneous urinary evacuation. One reason is that their urine cannot be so readily collected as that of men. With regard to such cases in women, however, practically the same conditions exist as have been described in our preceding case in the male. We have here from our feminine ward a patient who exemplifies this rather strikingly.

She is the wife of a stone-mason and has been under observation for some months. Her family history shows that several of her brothers and sisters have died from tuberculosis and that she herself has had many symptoms of a predisposition to the growth of the tubercle bacillus in her tissues. For over a year now she has been almost a constant sufferer from one or other tuberculous affection. Last summer she had an attack of pleurisy, with effusion, evidently of tuberculous origin. Last autumn she began to complain of increasing weakness and tired feelings in the legs, and certain disturbances of sensation in the skin were noticed. This hypæsthesia extended as high as the ribs. Since last Christmas the lower extremities have been entirely paralyzed. She has suffered from disturbance of the bladder since the beginning of the present year.

The first thing noted by the patient was that she was unable to micturate when she wished. For two days she did not pass a single

drop of urine, according to her own story. On the third and again on the fourth day, small amounts of urine were passed, but only as the result of an extreme effort of the abdominal muscles. On the fifth day she was catheterized by an attendant physician, who is said to have removed several litres of urine at that time. The patient did not complain of any actual pain in the vesical region. The great distention of the bladder occurred almost without discomfort. From the ribs downward the patient is entirely anæsthetic. The only sensation that the patient felt was that of great pressure in her abdomen, almost exactly, as she herself says, as if she were pregnant. From this time onward she was catheterized daily by a visiting nurse. It is to be noted, however, that she never at any time passed her urine in bed. This means not only that no large quantity of urine was passed involuntarily without instrumentation, but that not even the smallest amount found its way out of the bladder.

At the same time that the retention of urine occurred obstinate constipation made itself felt. On one occasion at the beginning of this trouble the patient passed eleven days without a movement of the bowels. From this time onward she has had rectal evacuations only after the administration of some purgative. On the other hand, she is entirely unable to retain flatus. Her menstruation, which had been quite regular before her urinary and rectal disturbance set in, became too profuse at first, but of late has not shown itself at all.

Since her admission into the clinic some months ago the patient has been catheterized twice a day. At the beginning of her stay in the hospital there was never the slightest tendency to spontaneous evacuation of the bladder. After she had been here about two months, however, the urine began occasionally to find its way out of the bladder without instrumentation, but only when the viscus was quite full. The patient has on these occasions, immediately before the evacuation of urine occurs, an indefinite sensation just behind the symphysis pubis. A few seconds later the urine begins to flow in a rather steady stream and continues with a slight interruption or two until a considerable quantity is passed. If the patient is catheterized only once a day, spontaneous evacuations of the bladder occur about every two hours. These evacuations do not begin, however, for some four or five hours after the catheter

has been used,—that is, not until the bladder is well distended by urine. There is sufficient preliminary warning, especially during the last few weeks, to enable the patient to secure a urine-glass and press it to the vulva before the urine begins to flow. These sensations now consist not only of the indefinite sense of pressure in the bladder region, which suddenly becomes insistent, but also of a certain feeling of burning at the end of the urethra. Urinary evacuation follows these sensations so soon, however, that it is only during the daytime, when the patient is conscious and ready at once to take the necessary precautions, that the bedclothing is not soiled.

The patient is never able to urinate voluntarily. During sleep her bladder empties itself spontaneously, much less often than during the day, but in larger quantity at a time. The patient always dreams that she is in the bath-room or seated upon a bedpan, and wakes immediately afterwards to find herself wet through.

The disturbances of sensation in this case are not confined to the legs, but reach up to the sixth rib. Not only is it impossible for her to feel an ordinary touch, but she is also insensible to the prick of a pin or to considerable pressure upon the surface. The fourth dorsal vertebra is rather prominent and is very sensitive to the touch. The lower extremities are completely paralyzed. The knee-jerks and ankle-clonus cannot be demonstrated. The anal reflex is, however, very lively, much more so than normal. Irritation of the skin at the margin of the anus is followed by contraction of the sphincter and at the same time by the lifting of all the region around the anus. This is evidently due to hyperexcitability of the levator ani muscle. When the soles of the feet are gently stroked, the dorsal flexion of the big toe, the phenomenon known as Babinski's reflex, is very marked.

In the evacuation of the excreta there has been no change in the condition of the patient during the past two months. Movements of the bowels occur only after the administration of purgatives. When the fæces are not too diarrhœic in character, the patient can give due warning, so as to be placed upon the bedpan in time to prevent soiling the bedclothes. Just before defecation takes place she has an indefinite sensation of pressure in the recto-anal region. Urine is passed at the same time with the evacuation of the bowels only when there has been no urination for a number of hours before. Watery injections into the rectum the patient is unable to retain.

She suffers at times from rather severe pains in the abdomen. This is a curious feature of the case when we recall the condition of the patient's sensibility. The skin of the abdomen as far up as the margin of the ribs is entirely anæsthetic. As we have said, not only are touches not felt, but even pin-pricks or considerable pressure are not noticed. It is probable, then, that some set of nerves connected with the internal organs and capable of conveying nerve impulses are as yet unaffected by the compression in the spine. It does not seem likely that any nerve-tracts have escaped the effect of the pressure, but there is evidently a path for sensation that does not pass through the spinal cord at the point of compression.

For several days catheterization of this patient was omitted. During this time urination occurred regularly every two or three hours, and the bladder was emptied not by continuous dripping, as is sometimes said to occur in these cases, but always by a steady stream until a considerable quantity, approaching two hundred cubic centimetres, of urine had been evacuated. In irrigations of the bladder, which are being given for the cure of the cystitis which is present, the patient suffers from a sense of discomforting pressure only after about three hundred cubic centimetres of liquid have been allowed to run into the bladder. If the injection is continued beyond this point, rather severe pains occur in the vesical region.

The nervous disturbances in this case are undoubtedly due to a tuberculous process at the level of the fourth dorsal vertebra. The compression exerted at this point has probably induced a softening of the cord. The urinary conditions are quite characteristic. At first there was the clinical picture of ischuria paradoxa,—that is, paradoxical retention of urine with overflow. Later on came the period of spontaneous urination, accomplished entirely without voluntary co-operation of the patient and which she was absolutely unable to influence in any way. Up to the present time there is also retention of fæces: only thin stools are spontaneously evacuated.

As the patient, though suffering from complete anæsthesia of the abdominal skin structures and the genitalia, has, a short time before the urinary or rectal evacuation is about to occur, an indefinite feeling that gives sufficient warning to enable her to take precautions, we must conclude that these sensations, taken in connection with the pains in the intestines, which are sometimes actually

colicky in character, find their way up to the central nervous system through some other nervous tract than that which conducts sensory impulses from the external skin. This sensory tract, whatever it may be, is not disturbed by the transverse pathological process which exists in the upper dorsal region of the spinal cord.

It might be thought that these cases, comparatively recent in origin, represent anomalous conditions with regard to urination which would not be found to exist in older cases of transverse spinal disease. I shall show you, however, some other patients who have suffered from these transverse spinal cord processes, most of them for many years, in whom exactly the same urinary disturbances developed.

Here is a patient who is at the present time an inmate of the almshouse. He comes occasionally to our clinic, because of indefinite muscular pains and some discomfort in the sexual organs. He noticed his first symptoms over fifteen years ago. He was exposed overnight to the dampness and cold of a forest and suffered almost directly after from paralysis of the legs. He is not able to give us any more details of his history nor of the urinary disturbances that he first noticed. He has now a spastic paralysis of the legs exactly like that which we so often see in cases of transverse myelitis as the result of the formation of cicatrices in the spinal cord. At present the patient is able only with the greatest difficulty to bring one leg before the other for walking, and he constantly rubs the floor with the anterior portions of his feet.

He has, in a word, the typical spastic gait. When this patient notices the first tendency to urination, he must at once make ready for the flow that almost immediately follows or he will wet his clothing. When he is lying down, however, notwithstanding the fact that there is an intense desire to urinate, he must constantly wait for nearly a minute before evacuation of the urine begins, but then it flows in a steady stream and continues until the end of the micturition without any necessity for employing his abdominal muscles. The use of the catheter after such urination removes from fifty to seventy cubic centimetres of residual urine, though the patient had a perfectly comfortable feeling as if his bladder were empty. A series of measurements of the quantity of urine passed shows that during the day the average is about one hundred and seventy-five cubic centimetres and that the inclination to pass water occurs

about once every hour and a half. During the night urinations are not so frequent and the average amount passed is about two hundred and fifty cubic centimetres.

Another patient here has been under our care for nearly fifteen years. In this case too there is a cicatrix in the nervous substance of the cord which has led to spastic paraplegia. The urinary disturbances are somewhat different from those of the preceding cases. This patient also must, as soon as the tendency to urination is felt, reach for the urine-glass at once, in order not to soil the bed, and urination may occur even during eating or, as you see now, in the midst of an examination. Voluntarily the patient is totally unable to bring about urination: she must wait until it comes of itself. Urine is passed in rather a steady stream, though it is usually interrupted four or five times and then begins again only after several minutes have passed. Because of these interruptions the patient is sometimes compelled to sit on the bedpan for nearly half an hour at a time, but after this she has rest for several hours. Rectal evacuations occur, as a rule, without simultaneous urination. This patient menstruates regularly every four weeks.

This reflex spontaneous urinary evacuation occurs not only in transverse lesions of the spinal cord, but also in other spinal affections. I have several cases of multiple sclerosis in which the urinary condition is quite similar to that just described. Here, for instance, is a man of thirty whose first symptom of multiple sclerosis was a beginning disturbance of vision nine years ago. Only during the last two years has unsteadiness in the gait and tremor come to make the diagnosis of the real condition certain. At the present time the patient has all the typical symptoms of multiple sclerosis, —nystagmus, scanning speech, a distinct rhythmic tremor in the arms, and double optic atrophy. The tendon-reflexes are increased, though there is no abdominal or cremasteric reflex. The gait is very unsteady, principally because of severe ataxia of the rump muscles.

In this case the urinary evacuation comes on of itself without any voluntary co-operation of the patient. The urine comes away, as I have often taken pains to observe, in an uncommonly strong stream. After the first feeling of pressure the patient must wait for fully a minute before the stream makes its appearance. If a urine-glass is not at hand, he must keep back his water by manual

pressure until a vessel can be obtained. There are from one hundred to one hundred and twenty cubic centimetres of residual urine. The average amount passed each time is between two hundred and two hundred and twenty-five cubic centimetres. The patient suffers not only from pollakiuria but also from distinct polyuria. The amount of urine passed in twenty-four hours is over two and one-half litres; it is never evacuated at the same time with the fæces. Flatus cannot be retained.

While this man has no command over the evacuation of his bladder or rectum, both of these receptacles can empty themselves by a spontaneous reflex beyond his control. Other cases of multiple sclerosis show a somewhat different condition of the urinary disturbance. Here is a young girl with the typical symptoms of the disease, who has feelings which make her think that urination is about to begin at times when it does not. Urination is spontaneous and not under the control of her will. Before going to sleep she tries to take precautions against soiling the bedclothes during the night, but fails to effect her purpose. When urination comes it is in a steady stream, never merely a continuous trickling. There are always interruptions that sometimes last as long as five minutes, but a satisfactory evacuation of the bladder finally results. Her urinations are not frequent,—as a rule, not oftener than twice, sometimes only once, in twenty-four hours. Naturally, she passes a considerable quantity of urine at one time. She is unable to interrupt the stream when once it has begun. After micturition is apparently complete, catheterization shows a considerable amount of residual urine, usually about three hundred cubic centimetres,—this in spite of the fact that the bladder evacuations give a sense of thorough satisfaction.

These clinical observations with regard to the occurrence of spontaneous urination in a good stream, and not a constant trickling, I have confirmed by a series of observations upon dogs. I have found that, as a rule, after removal of the lower part of the spinal cord in dogs, the urine is evacuated spontaneously several times a day, about equal amounts being passed at each urination. There is never any such thing as a trickling of urine, though the parts of the spinal cord removed are usually considered to be those in which the centres for the evacuation of the bladder and rectum are situated, and we would therefore apparently have a right to

expect bladder paralysis and the train of symptoms associated therewith.

It is well known that under certain circumstances urination is not entirely under the command of normally healthy individuals. Every practising physician of considerable experience has had occasion to observe persons who even with great effort could not from a full bladder evacuate the urine necessary for examination. It is impossible for them to urinate under conditions of slight excitement or in the presence of other persons. The muscles of the bladder are not under such direct control of the will as our ordinary muscles,—for instance, the biceps. It is well known that once vesical contraction has begun, it is very difficult to stop it. Besides the nerves which control the bladder from the brain and which run through the spinal cord down through the conus medullaris, it seems probable that there are other nerve-tracts supplying the bladder that take their course outside of the spinal canal. Rehfisch describes two sets of nerves to the bladder: one set comes from the ganglion mesentericum and these nerves have their terminations in the muscular walls of the bladder; the other set comes directly from the spinal cord. The ganglion mesentericum has a set of communicating nerves from the lumbar plexus. The duty of these spinal nerves seems to be to awaken the reflex which initiates the contraction of the vesical muscle. This muscular contraction may, however, be brought about of itself when a certain overfilling of the viscus takes place. Nearly the same thing is true of the rectum when its contents are fluid,—that is, of a character such that their ready evacuation is comparatively easy.

I have seen some cases in which injuries of the lower part of the spinal column in human beings have been followed not by the so-called paralysis of the bladder, but by the periodic vesical contraction that I have described in the other cases. I published not long ago a case of crushing of the lower part of the spinal cord in which after paradoxical ischuria for several weeks the patient went on to the stage of spontaneous periodical evacuations of the bladder. This patient is still under observation and the method of urinary evacuation has not changed. In recent medical literature we find a number of such cases, so that we may conclude that in localized lesions of the lowest part of the spinal cord the same urinary conditions exist as in the transverse lesions of the cord higher up. It

seems clear from this that the centres for the evacuation of the bladder and also of the rectum are situated outside of the cord itself.

This conclusion is of practical interest, because it shows that these patients who suffer from bladder disturbances in severe nervous diseases will after a time come to a period in the evolution of their urinary conditions in which they will suffer much less discomfort than at first. Spontaneous evacuation of the bladder and rectum will become habitual, and one of the most trying symptoms of these severe nervous diseases will be greatly ameliorated. It is extremely important, then, in the early stages of nervous diseases to take the most scrupulous precautions to protect such patients from vesical infection. Cystitis is almost the rule as the result of incautious catheterization. The presence of this infectious process probably lessens the normal tendency of the bladder muscle to contract, and so puts off the period after which urination takes place spontaneously though involuntarily.

It seems only right too in these cases that spontaneous urination should be encouraged by allowing the bladder to become somewhat uncomfortably distended in order to awaken the muscular reflex that distention produces. This makes it clear that frequent catheterization is by no means to be encouraged. The presence of residual urine is not a serious symptom for the patient and does not necessarily lead to infection. The use of unclean instruments in such cases, however, when the abnormal conditions render the bladder so much less resistant and so incapable of extruding infectious agents by complete contraction, is the most important thing to be guarded against.

TREATMENT OF ACUTE URETHRITIS.

CLINICAL LECTURE DELIVERED AT THE ALLGEMEINES KRANKENHAUS, VIENNA, AUSTRIA.

BY PROFESSOR ERNEST FINGER,

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GENTLEMEN,—The treatment of acute urethritis is now a subject of extreme interest to most practitioners of medicine, because urethral blennorrhœa has with the modern growth of large cities become more common than ever before. Notwithstanding our extensive experience with the disease, we are not yet in a position to give absolute rules that would apply to the treatment of every case. Each case of urethral blennorrhœa must be treated individually and according to the indications of the inflammatory process which may be found to be present. There are, however, a number of practical points that may be given for the guidance of the practitioner, and I propose to place them before you very briefly this morning.

The treatment of acute urethritis should accomplish three purposes. It must first obviate, and as far as possible remove, all factors that tend to disturb the ordinary course of blennorrhagic process or that may increase the acuity of the inflammation and thereby be the source of further complications. Secondly, it should provide remedial measures that will lessen the unpleasant symptoms of the disease. Thirdly, it must insure an abbreviation of the course of the disease. These three indications comprise the hygienic, the symptomatic, and the local treatment of acute urethritis, and, when fulfilled, they constitute the ideal of gonorrhœal therapeutics.

With regard to the hygienic treatment, the primary indication must be the avoidance of all possible sources of harm. The first requisite is, of course, rest. As rest in bed is, in most cases, practically impossible, all violent movements must be absolutely forbidden. Running, horseback exercise, bicycle riding, gymnastics,

dancing, or hunting expeditions, and all excesses in venery should be avoided; and, more than this, even the normal exercise of the sexual function must be forbidden.

Proper diet is an extremely important part of the hygienic treatment. All drinks that contain carbonic acid are harmful. Champagne, beer, selters, vichy, carbonated water, and the like, must therefore be forbidden. Alcoholic drinks are also injurious. There must be no drinking of spirituous liquors, and even the use of strong wine should be prohibited. It is best to limit the patient to the use of milk and water.

Unfortunately, however, patients who wish to conceal the existence of their disease are not infrequently placed in positions in which it is impossible for them to refuse alcoholic drinks without betraying their condition. I have often observed that the use of wine at rare intervals by patients who had been for a considerable time absolutely abstinent causes more harm to their gonorrhœa than the use of limited amounts regularly. I therefore advise my patients who have been accustomed to drink moderately to take every day during the continuance of their gonorrhœa a small amount of red wine mixed with water, and under no circumstances to depart from this rule. Besides alcoholic drinks, all piquant, highly-spiced food, whose irritant principles are liable to get into the urine, should, of course, be avoided. Care must be taken that the patient shall have a satisfactory evacuation of the bowels every day. This is extremely important, though sometimes neglected.

The wearing of a properly-fitted suspensory bandage is of great benefit, especially in the prevention of sequelæ in the testicles.

The object of the symptomatic treatment is the relief of the painful and discomforting symptoms of the blennorrhagia. The more important of these are the pain and difficulty in urination, distressing erections, and frequent pollutions. As concentrated urine causes intense irritation of the urethral mucous membrane, the first indication is to dilute the urine. This is accomplished by the use of considerable amounts of liquid, though care must be exercised that patients do not go to excess in this matter by drinking too much water, for, as is well known, gonorrhœa patients are apt to follow advice too literally, and the consumption of large amounts of water leads to frequent urination and consequent irri-

day. This is extremely important, though sometimes neglected.

If the pain during urination is considerable, as happens in acute posterior urethritis, or if a reflex spasm of the compressor urinæ muscle causes difficulty of urination, warm sitz-baths or the application to the perineum of sponges dipped in warm water will give relief. In these cases narcotic or antispasmodic drugs may be used; but it must be remembered that opium causes constipation, and this effect should be guarded against. I prefer to give these drugs as suppositories, and I use one of the following formulas:

℞ Extr. bellad., gr. ii;
Butyr. cacao, q.s. ad supposit. No. x.
Sig.—One suppository morning and evening.

or,

℞ Morph. hydrochlor., gr. iss;
Butyr. cacao, q.s. ad supposit. No. x.
Sig.—One suppository morning and evening.

At times, as a result of intense congestion of the urethral mucous membrane, complete retention of urine occurs. This may be overcome by prolonged warm baths or by suppositories of morphine, or the morphine may be injected subcutaneously. Never except in extreme cases should the catheter be employed. For painful and frequent erections and for repeated pollutions various bromide preparations with camphor and lupulin will often give excellent results. My preference, as the result of considerable experience, is for prescriptions about as follows:

℞ Camph. monobrom., ʒi.
Divide in caps. No. xv.
Sig.—Three or four capsules daily.

℞ Potassii bromidi, ʒiiss to ʒss;
Lupulin., gr. viii to gr. xx;
Camph., gr. viii to gr. xx.—M.
Divide in chart. cerat. No. x.
Sig.—One or two powders at night, in wafers.

Three or four days will elapse before the effect of these powders is noticed. If hæmaturia occurs, ergotin should be employed, or the sesquichloride of iron may be given internally. The flow of blood in hæmaturia seems to be due to a cramp-like contraction, which is often relieved by subcutaneous injections of morphine. The sedative effect of this drug upon the circulation is also important in lessening the tendency to bleeding.

Local treatment, the application of solutions directly to the urethral mucous membrane, may be given either by the mouth, in which case they reach the urethra through the urine, or by means of topical injections. The so-called internal treatment of gonorrhœa is really only an indirect local treatment. The remedies usually used are the balsams, the active principles of which, mostly in the form of combinations of sodium, pass into the urine. The most effective of these are copaiba, sandal wood, turpentine, and cubebs. The representative of this group is copaiba. Substitutes for it are Peru balsam and tolu balsam, but these are scarcely to be recommended. During the first two weeks of the existence of a urethritis the treatment should generally be limited to the symptomatic and hygienic, entirely avoiding local treatment, since it is apt to aggravate the inflammation. Even the balsams somewhat increase the inflammatory symptoms, being slightly irritant, though much less so than injections. When the symptoms are very acute, the balsams should not be prescribed. If, however, the inflammatory symptoms of the urethritis are from the very beginning of the affection not acute or productive of serious discomfort, it is my custom to give, even during the first two weeks, the balsamic preparations. I begin the mildest local treatment with these, and when the inflammatory symptoms have considerably lessened I prescribe injections.

The balsams are particularly useful in acute posterior urethritis, the treatment of which in the usual way—by means of injections with a urethral syringe—can be accomplished only with considerable difficulty. This is an observation that almost any intelligent patient will himself make. Though he succeeds very well with injections in the cavernous part of the urethra, when the injected fluid reaches the pars membranacea,—that is, comes in contact with the compressor urethræ muscle,—two difficulties are encountered. First, there is a cramp-like spasm that closes the urethra, due to reflex contraction of the compressor muscle, this becoming more marked the greater the effort the patient makes to overcome it; or, secondly, just as soon as the fluid comes under the influence of the compressor urethræ muscle all the liquid in the urethra is ejected. The result is the same in both cases: while the fluid reaches the pars cavernosa of the urethra, it does not find its way into the deeper urethra, where its therapeutic effect is needed. It

is quite different with the balsamic treatment: every part of the urethra is touched by the urine laden with the therapeutic principles of the balsam, and the local application is completed in a way that is extremely difficult to accomplish with the syringe except after certain complicated manipulations.

When the posterior urethritis is acute, however, the balsams increase the irritative inflammatory condition and should not be given. I have never been able to persuade myself that a urethritis could be entirely cured by the administration of the balsams alone. One disadvantage of these remedies is their effect upon the intestinal tract. They often cause a certain amount of gastritis and diarrhœa, and when there is already a dyspeptic condition they should be avoided. At times, in predisposed patients, they give rise to an erythema, an urticaria, or even a balsamic purpura. At times they cause an irritation of the kidneys, which is manifested by a persistent aching in the loins. If any of these complications occur, the use of the balsams must be immediately discontinued.

It must not be forgotten that when the balsams are used freely the urine contains certain acid products which give a white precipitate with nitric acid. This may very easily be mistaken for albumin, and cause disquietude for both the physician and the patient. In an excess of nitric acid, however, the precipitate is redissolved, showing that it was only a soluble salt, and not an albuminous material.

Copaiba is best borne if given pure in doses of from ten to fifteen drops three times a day, in wafers or, better, in gelatin capsules. These cause least disturbance when taken on a full stomach, and so the capsules should be prescribed for use immediately after meals. Patients who bear the balsams well can gradually increase the dosage up to five or six capsules a day. If it is desired to give the copaiba, as formerly, in a mixture, the following formula is a very suitable one, according to my experience:

℞ Bals. copaib., ℥i;
Ol. amygdal. dulc.,
Mucil. gum. arab.,
Syr. cortic. aurant., āā q.s. ut fiant
Mist. oleos. ponderans ℥vii.

Sig.—Two or three teaspoonfuls a day, to be increased gradually to six teaspoonfuls if well borne.

In France, particularly, the Chopart mixture has long been popular. It is often a very satisfactory remedy, and its formula should be in the note-book of every physician, for there are some patients by whom copaiba is borne better when administered in this form than in any other.

℞ Bals. copaib.,
Alcohol. puri,
Syrup. tolut., āā f ℥iss;
Aq. menth. pip., f ℥iii;
Ac. nitric. dil., f ℥ii.—M.
Sig.—From three to six teaspoonfuls a day.

According to many authorities, sandal wood oil is even more useful than copaiba in the treatment of gonorrhœa; it was introduced originally by Panas, in 1865. It is almost exactly the same in its effect as copaiba, but it very seldom produces gastric disturbance. It is, however, more likely to set up some kidney irritation. When used with care, it is preferable to copaiba balsam. This may also be said of gonorrhol, an ethereal extract of sandal wood oil, which shares with it the property of irritating the gastro-intestinal tract only very slightly. A favorite prescription of mine is as follows:

℞ Ol. santal. rubr., gtt. iv;
In caps. gelat., No. xx.
Sig.—Three to six capsules per day.

Or gonorrhol may be substituted for the sandal wood oil in the same dose.

Turpentine is more effective than copaiba balsam because it produces less irritative symptoms. It is especially useful in acute posterior urethritis. Unfortunately, its administration is often followed by serious gastric disturbance, which makes it unsuitable in many cases.

A satisfactory method of prescribing the drug is as follows:

℞ Terebinth. Venet., pur., gtt. v to x;
Extr. gentian., gr. iv;
Pulv. lycopod., q.s. to make one pill.
Sig.—Two pills per day, after the principal meals.

Cubebs are not well borne, as a rule, in the acute stage of gonorrhœa. They are of great service, however, after the acute stage

has run its course and all the irritative symptoms have disappeared, leaving in their wake considerable secretion. Under these conditions they make an excellent accessory therapeutic aid. I have even had the experience that a urethritis which proved refractory to various forms of injection for a long time at once progressed rapidly towards a cure when cubebs were given internally. Cubebs may be given alone or in combination with one of the balsams. For cubebs alone I give—

℞ Pulv. cubeb.,
Extr. cubeb. fl., āā gr. xxxv.
Pulv. lycopod., q.s.
Ft. pil. No. xxx.
Sig.—Three to six pills per day.

The following combinations with other balsamic remedies have given satisfaction occasionally in my own practice and are recommended by others:

℞ Bals. tolut.,
Bals. cubeb., āā gr. l.
Ft. pil. No. xxx.
Sig.—Three to six pills per day.

The patient should begin with three pills, and increase the number, if they are well borne, up to six per day.

This formula is a favorite in many clinics:

℞ Bals. copaib.,
Pulv. cubeb., āā gr. l.
Extr. gentian, q.s. ut ft. pil.
No. xxx.
Lycopodium pulv.,-q.s.
Sig.—Three pills three times a day.

Sodium salicylate, in doses of from fifteen to thirty grains, three times a day, has often an excellent effect in acute posterior urethritis.

Regarding the local treatment of gonorrhœa, the injection of astringents, once so much recommended, has undergone a series of important modifications concerning the technic of the method of treatment and the drugs to be employed. As has been already stated, one difficulty in the use of injections is that patients are not able to bring the injected remedy into contact with all the affected

parts of the urethral mucous membrane. Those parts that are untouched by the drug do not heal, and so gradually reinfect the other parts. This leads to frequent relapses, or to the development of a chronic blennorrhagia.

Simple astringents are now only in the third category of remedies among the drugs to be employed for gonorrhœa. There are two other groups of remedies much to be preferred. These are the pure antiseptics, such as protargol, largin, and argonin; or the drugs that combine antiseptic with astringent qualities,—nitrate of silver, argentamin, and itrol; or the less useful remedies, potassium permanganate, zinc, sozoiodol or ichthyol. Of these drugs, the pure antiseptics are to be used as soon as there is indication for them. The antiseptic astringents are only to be employed later, when the disease has entered upon its subacute phase.

TREATMENT OF ACUTE ANTERIOR URETHRITIS.

At the present day the opinion is generally accepted that we must begin the treatment of acute urethritis as soon as possible with the injection of antiseptics. There is, however, a group of cases in which the intensity of the inflammatory symptoms forbids the immediate institution of therapeutic injections. In this category belong all the cases in which the gonorrhœa begins with very severe symptoms, or in which the severity of the symptoms, as the result of the development of the disease, brings the patient to the doctor for the first time. If there is much swelling of the glans penis and considerable prolapse of the urethral mucous membrane at the penile orifice, it is evident that the use of injections is contraindicated. This is also true if there is a condition of lymphangeitis on the dorsum of the penis, or if the secretion, though frankly purulent, is mixed with blood.

Certain other contraindications to the use of injections very early in the case deserve to be mentioned. Œdema of the prepuce, for instance, whether it causes complete or incomplete phimosis, is one of these. Severe pain in urination or in erection are of themselves sufficient to prevent even the mildest form of therapeutic injection, because the patient is not able to stand the mechanical manipulations that are necessary in order to permit of injections into the urethra.

In all of these cases antiphlogistic treatment must first be em-

ployed. The use of evaporating lotions is indicated. Cloths wrung out of lead-water and laudanum should be first applied. Various sedative remedies should be given internally, as opium or its derivatives, or the following prescription:

℞ Extr. cannab. indicæ,
Extr. hyoscyami, āā gr. ⅛.
Sig.—One powder four or five times daily.

The inflammatory process itself is treated by the internal use of the balsams. Only after the more acute symptoms have disappeared under this method of treatment should local treatment be tried.

This group of cases, however, with very severe initial symptoms is not large, and in all other cases local therapy should begin as soon as possible, and should be carried out with the strongest antiseptics we have,—protargol and largin. Largin is the most fatal to gonococci, but as its alkaline reaction very easily causes an inflammatory irritation of the mucous membrane, I usually prefer to begin with protargol, and then take up the use of largin later on. I begin with a one-fourth of one per cent. solution, increasing rapidly up to a two per cent. solution. The patient uses injections every eight hours, and retains the fluid for from ten to fifteen minutes in his urethra. This is necessary if the protargol or the largin is to obtain its full antiseptic effect.

After three or four days of this treatment the secretion becomes very much reduced, and usually consists of scarcely more than shreddy particles. The subjective symptoms have practically disappeared. All that remains of the inflammatory process is confined to the anterior part of the urethra; and this is perhaps the greatest advantage derived from the antiseptic method. When the secretion has become very slight, the pure antiseptics should be replaced by astringent antiseptics. A largin or protargol solution is employed once or twice each day; the other injections should consist of a solution of nitrate of silver in the strength of from one-third of one per cent. up to one per cent. An injection of argentamin, one-half to one per cent. solution, is then useful for the purpose of terminating the treatment. This should be continued for several days, or until the shreds have entirely disappeared from the urine. Injections should be given at lengthening inter-

vals for seven or eight days after the absence of the shreds. The patient may be said to be entirely cured only when a return to his former life causes no signs of a recrudescence of the inflammatory process. The demonstration of gonococci in the secretion is the only sure evidence of the continuance of a gonorrhœa. In certain sensitive people the injections that are used in the treatment of gonorrhœa are of themselves sufficient to produce a catarrhal secretion, which is not, however, specific in character nor of an infectious nature. If coitus be practised at this time, a condom should be employed.

If no gonococci can be found, while shreds continue to be present in the urine for a considerable time, though in small numbers, it is well to interrupt the treatment for a period, as a test of the true nature of the work of the secretory process. If upon the interruption of the treatment the shreds should increase in amount and gonococci reappear, it is evident that the gonorrhœal process is still at work, and active treatment must be resumed. If the shreds decrease in number, however, it is well to use milder measures rather than to take up again the astringent antiseptic treatment. The most efficient and reliable remedy for the catarrhal process without gonococci that occurs as a terminal stage of a gonorrhœa treated by antiseptics is injections of subnitrate of bismuth, well shaken, in a solution of two per cent. strength, this being allowed to remain in the urethra for four or five minutes.

The important part of the technic of the injections is that they must be taken at regular intervals of eight hours. In order to bring the injected fluid in contact with the mucous membrane when it is as free as possible from secretion, the patient should be counselled to urinate immediately before the injection, and also to wash out the urethra with a small amount of lukewarm water. In this way the remedies will act more directly upon the cells of the mucous membrane. For sensitive persons the solution may be slightly warmed before each injection.

There should be a sufficient quantity of the injection solution used to bring it in contact with the whole extent of the diseased mucous membrane. The syringe used for this purpose should hold from twelve to fifteen cubic centimetres. In order to prevent the injection material from flowing outward, the orifice of the urethra must be well closed. To secure this the syringe should have a conical

end. The fluid should be injected under light, regular pressure, as injections made forcibly or under irregular pressure will cause reflex contractions of the bulbocavernosus and ischiocavernosus muscles. These precipitate ejaculations of the material out of the urethra.

TREATMENT OF ACUTE POSTERIOR URETHRITIS.

As in acute anterior urethritis, the treatment of posterior urethritis requires careful individualization. We are not treating a general condition, but a condition in a special individual. Cases of posterior urethritis must be divided into several groups, then, in order to indicate the proper mode of treatment.

The first group includes those in which the posterior urethritis makes its appearance with very acute symptoms. The most prominent of these is a constant and torturing desire to urinate, the act of urination being followed by blood. In these cases local therapy is out of the question,—we can only treat them symptomatically. Rest in bed is extremely important, the use of bland, unirritating food must be insisted on, and calmative drugs should be given. Suppositories of extract of belladonna, for instance, may be prescribed as follows:

℞ Ext. belladonnæ, gr. $\frac{1}{3}$.
Ft. suppositorium.
Sig.—Suppository, two or three times a day.

Or morphine twice daily,—

℞ Morphin. muriat., gr. $\frac{1}{6}$ to $\frac{1}{3}$.
Ft. suppositorium.
Sig.—One suppository, twice a day.

When the symptoms are very intense, subcutaneous injections of morphine may be employed,—from one-sixth to one-third of a grain,—once or twice a day. The tendency to bloody urine can be best controlled by the internal use of ergotin. About one and a half grains, two or three times a day, may be given. Bonjean's preparation of ergotin can be used subcutaneously for the same purpose. The liquor of the sesquichloride of iron is also an excellent remedy for hæmaturia. The urine will be rendered less irritating by the administration of flaxseed tea or of a decoction of the leaves of uva ursi.

When the intense symptoms disappear, or when the acuteness of the posterior urethritis is lessened, more direct therapeutic measures can be adopted. The symptoms usually consist of cloudiness in portions of urine passed in two glasses and in a tendency to more frequent and painful urinations. At times, in addition to these symptoms, there is considerable pus in the anterior urethra. Under such conditions the salicylic preparations can be employed with good results. I prefer the sodium salicylate, in doses of from fifteen to twenty grains, dissolved in a full glass of water, and taken three times a day. A half gramme of salol (eight to ten grains) or a gramme of salipyrin (fifteen grains), three or four times a day, may be employed in the same way. After a few days' treatment with the salicylates, the subjective symptoms mostly cease, the secretion lessens in amount, and the second portion of the urine clears up. Some authorities in urethral therapeutics use the balsams in these conditions, but I have never found them as useful as the salicylic preparations.

The local treatment of acute posterior urethritis is possible only when the subjective symptoms have entirely disappeared or during periods when they are not present. It must be varied, however, according to the individual symptoms. If the patient has, for instance, besides the posterior urethritis, a profuse secretion from the anterior urethra, then the local treatment of the posterior portion with catheters or by other local measures is contraindicated as long as the secretion continues.

Local treatment is usually begun with the injection of a warm solution of protargol, or largin, one-fourth of one per cent., the injections being made with an ordinary urethral syringe and the fluid being retained in the urethra for from ten to fifteen minutes. Such non-irritating solutions do not cause any spasm of the external sphincter, or the spasm is of so mild a character that the muscle soon relaxes. As a consequence the solution finds its way in most cases eventually into the posterior urethra, and therefore has a direct therapeutic effect upon the inflamed part. These solutions, when injected three times a day, will cause the secretion from the anterior part of the urethra to lessen, thereby diminishing the chances of reinfection or the further spread of the disease.

When there is very little secretion from the anterior urethra, or when it has been considerably lessened by the injections, then

the local treatment of the posterior urethra, as I have said, is indicated. The applications should be made directly to the parts. There are two instrumental methods that may be employed for the local treatment of posterior urethritis,—the so-called Diday's irrigation method and the instillation method with instruments devised by Guyon or Ultzmann. The difference between these two methods consists in the fact that the irrigation form of treatment uses the dilute solutions in large quantities, while in the instillation method the concentrated solutions are applied in small amounts. As the first method is the least discomforting, I always begin with it.

Diday's irrigation method consists in instructing the patient to come for treatment with a rather full bladder. He is then asked partly to empty that organ, in order to clear the urethra of secretory products, after which a medium-sized rubber or linen catheter is introduced into the urethra until urine begins to flow from it. The catheter is then partly withdrawn, far enough to prevent the flow of urine. The eye of the catheter at this moment rests just within the internal sphincter in the prostatic urethra. The extravesical end of the catheter is then connected with an irrigator, and the injection fluid is allowed to flow into the catheter while the instrument is very slowly withdrawn from the urethra.

All the fluid injected into the prostatic urethra finds its way into the bladder and becomes mingled with the urine. This prevents contact between the bladder walls and the undiluted solution, —hence the necessity for leaving some urine in the bladder. When the eye of the catheter has been withdrawn as far as the bulb of the urethra, the injection solution flows backward along the side of the catheter through the anterior urethra and then out of the external orifice of the urethra. In this way the whole mucous membrane of the urethra is brought into contact with the solution. The solutions employed for this purpose are protargol, or largin, one-quarter per cent.; permanganate of potash, 1-5000; or sulphocarbolate of zinc, 1-1000. In my own practice I prefer nitrate of silver (1-1000, gradually increased to 1-500) to any other remedy. Irrigations with these solutions, always previously warmed, should be made once every forty-eight hours, or once every twenty-four hours if the patient is not very sensitive.

After a few injections the patient's condition is so much im-

proved that he can make instillations with the apparatus of either Guyon or Ultzmann. With both of these instruments the injection fluid is deposited drop by drop from the bladder to the external orifice of the urethra. For this purpose a concentrated solution of largin, or protargol, one to two per cent. in strength, is used, and rather stronger solutions of nitrate of silver every twenty-four to forty-eight hours.

These methods of treatment are employed until the secretion ceases and the shreds have disappeared from the urine. It must not be forgotten, however, that the employment of strong injections may of itself produce shreds and a reactive catarrh. If the shreds contain no gonococci, it is better, after the secretion has continued for some time, to interrupt the treatment for a few days and note the results. If the shreds are the effect of irritation, they disappear. If they remain, treatment must be continued.

It must also be borne in mind that when all the superficial portions of the urethra affected by the gonorrhœal process are entirely cured, there may still remain gonococci in the glands of the urethra and in the urethral follicles, where they maintain a latent existence for a long period. Some excess may cause the contents of such an infected gland or follicle to be pressed out into the urethra, and autoinfection and relapse will follow. It is an absolute principle in my own practice that patients should be kept under observation until they have returned completely, though gradually, to their normal method of life and I have assured myself that there is no tendency to relapse. As a rule, I discharge patients as cured only when all the ordinary sources of irritation of normal life have produced no relapse,—that is, lead to no renewed secretion and give rise to no reappearance of the shreds in the urine.

PASSIVE MOVEMENTS AND MASSAGE FOR THE TREATMENT OF FRACTURES.

A CLINICAL LECTURE DELIVERED AT THE HÔTEL DIEU.

BY PROFESSOR LUCAS-CHAMPIONNIÈRE,

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GENTLEMEN,—For more than twenty years now I have been interested in a very radical modification of the ordinary treatment of fractures. You know very well that the ordinary principle, generally accepted by surgeons all over the world, has been that the parts in which the fracture has taken place must be absolutely immobilized for the length of time necessary to secure firm union of the fragments. Now, the fundamental condition of the modified treatment of fractures that I have endeavored to elaborate and have successfully introduced in my own practice is that the limb in which a fracture occurs shall be submitted to passive movement, either with or without massage, almost immediately after the occurrence of the fracture. A certain amount of passive movement after primary union of fragments has occurred—that is, after the fourteenth day—is not uncommon in general practice, especially for fractures in the neighborhood of joints. It is the application of movement a day or two after the fracture which forms the basis of my method and differentiates it absolutely from all other methods suggested before my original work on the subject.

There are two reasons for the discussion of the originality of the method of which I intend to speak to you to-day. Because of misunderstandings, there have not been wanting men who have claimed the authorship of the suggestion. Immediate passive movements and massage in the treatment of fractures were, however, unknown before I showed their advisability in many cases. Some surgeons have imagined that what I meant by passive movements and massage were the ordinary movements undertaken after union of the fractured part in order to cause the disappearance of

the stiffness which so often ensues. This massage late in fractures has, however, been known and practised for a very long time, although it must be confessed that its practice was rather irregular and unsystematic. I have not the slightest idea of claiming any credit for its invention, since the method of treatment that I suggested was deliberately thought out with the idea of *preventing* the stiffness of joints that the other method was meant to cure. If the stiffness is prevented, this secondary massage is evidently useless.

Another source of misunderstanding with regard to this method has been the idea that by the word "massage" was intended rather rough handling, like those proceedings which certain masseurs employ. Massage of this kind employed immediately after the occurrence of the traumatism would evidently do more harm than good. Some surgeons, however, have been inclined to think that such brutal rubbing of the tissues was employed directly at the seat of the fracture. By "massage" I understand a gentle rubbing done not directly over the fracture, but in its vicinity and in associated tissues. The word "massage" as ordinarily employed does not quite express my meaning, and it would have been better if some other term had been used. I would perhaps have been open to less misunderstanding had I called my rubbing by some such name as glyco-kinesis,—gentle movement,—for this would have fixed the meaning of the term and called especial attention to the limitation of the practice. I am not one of those, however, who think they have made a wonderful invention when they invent some long Greek term to express a shade of meaning that ordinary words may well indicate. I found the word "massage" ready to hand, and I used it in a very definite signification with proper limitations.

What is really the foundation of this new method of treating fractures is methodical movement. This method of applying movement to the treatment of fractures can be employed very frequently. It ought not to be employed, however, for every fracture without selection, otherwise it would be open to many objections. For instance, in a fracture of both bones of the leg with considerable displacement of the fragments methodic movement would be absurd. On the other hand, the recommendation to dispense with apparatus in the treatment of many fractured limbs must not be considered to imply an absence of treatment or the neglect of special care. We must only insist that under certain circumstances the immobili-

zation of a limb is as harmful as the leaving the limb entirely to the forces of nature. The rigorous application of the classical teaching that the treatment of fractures must be carried on by absolute immobilization in every case is, therefore, in my opinion unscientific.

The new method of treatment consists in immediate methodical movements of the region of the fracture combined with gentle and progressive massage. It would be entirely wrong to attribute to this method any specific curative effect, as is true of massage for sprains. In sprains the most prominent symptoms, as a rule, are caused by tension within the joint. The pain and the disability incident upon the overstretching of the capsule of the joint are actually relieved by the kneading of massage, because nature is thereby encouraged to reabsorb the fluid that has been thrown out during the inflammatory disturbance. In the case of fracture no such thing happens. Time is the most important element needed for the repair of broken bones. The principle on which the new method of treating fractures is founded may be briefly stated as follows: Moderate, methodical movement favors the reunion of the fractured extremities of bones. It is of distinct assistance in the formation of a solid callus.

From the very earliest times in medicine it has been considered that the more perfect the immobility of the extremities of a broken bone the more perfect was the process of repair by means of callus formation. This idea is so well recognized that a distinguished French anthropologist, M. Manouvriez, finding in an old cave some bones that had evidently been broken and afterwards grown together regularly concluded that the savages who lived in this cave had somehow conceived the idea of making the necessary surgical apparatus in order to set bones absolutely at rest during the process of repair. It did not seem to him possible that repair could have taken place, leaving the bones as before, without more or less perfect immobilization. As far as we know anything about the history of surgery this idea of the necessity for immobilization has been accepted. As we get nearer and nearer to our own times we find that the apparatus necessary to secure absolute immobilization became more and more perfect.

It is probably this very excess of the application of the principle of immobilization by immovable apparatus that has brought into

strong relief the defects of the old system which led to the formulation of a new method of treatment. Many of the advocates of immobilization admitted its dangers and inconveniences. No one, however, ventured to suggest that a different method of treatment might succeed, and no one had the courage to suggest a reform.

It has for a long time been known that certain forms of fracture healed perfectly even when the bones were not placed absolutely at rest; though treated contrary to all accepted principles, the results obtained were very satisfactory. Horse-jockeys, for instance, who are especially liable to fractures of the clavicle, often refuse to permit themselves to be encased in bandages in such a way as to secure immobilization of the ends of the broken bone. Most of these cases gave perfect results, notwithstanding the bad anticipations and prognoses of the surgeons in the cases. We find scattered here and there in medical literature an account of such cases, but always with a note of surprise at the good result obtained. The surgeons always considered the successful repair of the bones to be due merely to a happy chance.

About twenty-five years ago Bousquet, of Aix, a French surgeon, in a short article made the remark that the stiffness of the fingers which often forms a serious complication after fracture of the radius might be prevented if the fingers were moved from time to time within the apparatus. He added also that some benefit in this respect might be derived from the occasional employment of gentle massage. His suggestions in the matter are, as can easily be seen, rather timid. At the time that he wrote his article I was treating fractures of the radius without the use of any apparatus.

Metzger gave the formal advice to use massage in the treatment of fracture of the knee-cap, and a certain number of observations were published on this subject about twenty years ago. These authors admitted, however, that in fractures of the knee-cap there was no danger of preventing the formation of a bony callus, since there was no tendency to any formation of bone in these breaks and the surgeon had to be satisfied with a fibrous callus. Their reason for the employment of massage was that the injury to the knee-joint inflicted by the traumatism which caused the fracture of the knee induced a condition of the joint quite similar to a serious sprain. It was this sprain rather than the fracture for which they advised the employment of massage. Metzger devel-

oped the massage treatment for sprain and employed it in serious or lighter injuries of this kind. When he had to treat a sprain of the ankle-joint, however, complicated by fracture of the fibula, he did not consider that massage should be employed. Metzger's recommendations led to the employment of massage in certain sprains complicated by fractures, and it began to be conceded that massage, instead of delaying, might help in the healing of fractured bones. Norstrom made some excellent observations in this matter, and in his treatise on massage stated that massage was by no means so contraindicated in certain forms of fractures as was thought. He did not, however, formulate any definite method of treating fractures by movements or massage.

The preliminary steps in the development of the method that I had the honor to introduce can be traced very easily in a series of publications which show that I was progressive enough to suggest its application to a series of fractures that had been hitherto considered incapable of treatment by such a method. Between 1880 and 1885 I made a series of observations on all the varieties of fracture which would be benefited by passive movements of the fragment and on the forms of massage best suited for the favorable treatment of the conditions associated with fractures. I had to proceed, of course, groping somewhat in the dark. My trials were made in hospital practice, and it was several years before I arrived by actual experience and clinical observation where I could formulate the line of treatment differing from the old immobilization which I felt sure would be an improvement upon it. In 1886 I made my report in the matter before the Paris society of surgery. For several years before this my observation had included a number of cases, and I had applied the method of treatment not only to fractures of the radius and the fibula, but to nearly every other form of fracture. Since then I have published from time to time the improvements in the method which practical experience has suggested as advisable.

The old ideas in surgery demanded immobilization, first, in order to secure the redintegration of the original form of the injured limb; secondly, in order to assure the union of the broken bones by proper callus formation; and, thirdly, to prevent or heal the inflammation of neighboring tissues consequent upon the traumatism which caused the fracture. Immobilization was then the

indispensable condition for the resumption of perfect function by the injured limb.

The principles on which the new methods of treatment are founded are exactly contradictory of these accepted generalizations of the old time. The new principles are, first, movement is necessary for the repair of all living tissues. It is indispensable for the maintenance of their regular vitality. Movements should be instituted as soon after the traumatism as is possible without the infliction of unbearable pain.

The second principle is that the beneficial influence of movement is undisputed for all soft parts; it is just as manifestly necessary, however, for the solid portions of the tissues, notwithstanding the fact that their main purpose is to act as rigid levers. The bones as well as the soft parts resume after movement a vitality that makes healing much more rapid and complete. As the result of movement the bony callus forms much more quickly, becomes solid sooner, and is more resistant to unfavorable external influences. The union of the broken ends takes place consequently with less delay and trouble.

It is not every form of movement, however, which aids thus in the repair of the tissues. It must be methodical movement and must be regulated to suit each individual case. Excessive movement would undoubtedly prove a source of serious inconvenience and perhaps injury. If the injured limb is simply abandoned to its ordinary functional movements, the harm that would result is evident. The application of massage such as I have intended, especially when applied immediately after the injury, enables us to realize the character and amount of movement that will be useful in each individual case.

This massage is undoubtedly the best method to anæsthetize the limb and to cause the pain in it to disappear. Immobilization only suppresses pain; the discomfort reappears every time that a movement is attempted. Besides, immobilization inevitably leads to stiffness, and this gives rise later in the case to a new form of pain. Massage gently and properly applied leads to very rapid disappearance of the pain of the fracture, and this of itself is the best criterion of the value of massage as a method of treatment. Whenever massage is painful, you can be sure that it has not been done in the way that I advise.

With the disappearance of the pain, the tendency to contracture disappears. This method of treatment enables us to study more perfectly than with the old immobilization apparatus the *rôle* that muscular contracture plays after fracture in causing discomfort and even at times actual displacement of the fragments. This muscular contracture is one of the most important complications of fracture. It is responsible for many of the unfortunate results. Apparatus are often completely impotent to overcome it. There is no doubt, then, that a form of treatment such as massage, which causes the contracture to disappear very shortly after the occurrence of the fracture, naturally assures the disappearance of any tendency to displacement dependent on contracture.

There are four parts in which injury with fracture has been especially liable to be followed by permanent deformity. These four are the clavicle, the upper end of the humerus, the lower end of the humerus, and the olecranon. Fractures in these four regions especially are benefited by treatment with early massage. It is the success obtained in these cases that amply justifies the continued use of the method.

After an accident the resorption of the liquid material that has been effused as a consequence of the injury of the tissues and of the anatomical elements that are destined to degenerative loss of vitality is accomplished with infinitely more rapidity if the injured part is subjected to massage. The ecchymoses and effusions can be seen to disappear from day to day. The vitality of the cutaneous tissues is preserved. The vitality of the whole limb is re-established and the processes of repair are encouraged instead of being delayed. Castex's experiments have shown the special method of repair of nerves and muscles after massage. Movement and massage maintain the suppleness of the parts during the whole of the treatment.

One of the arguments in favor of the employment of closed and immovable apparatus is the supposed necessity for the bony reparative process reproducing exactly the form of the broken bone. The claims made for apparatus in this regard are exaggerated. In spite of them serious deformities may be produced. It is often noteworthy, however, that the function of the limb may not be seriously interfered with by the new condition. Nature accommodates herself very well to certain alterations of form, and it must not be for-

gotten that our guide in the matter of correction—the shape and form of the other limb—is often not an exact model of the broken one, the two limbs being seldom of the same size or length.

Deviations of the axis of the limb are important and must be avoided by all means, because they tend to produce serious disability. Slight shortening and deviations, so long as they do not change the points where muscular force is applied, are of little importance as far as regards their effect upon function. In recent years we have been able to confirm by means of radiograms the opinion that I have long held in this matter. Even in apparently completely corrected fractures, where by the use of the most perfect of immobilizing apparatus good results have been supposed to be due to absolute correction, slight deformities exist after the repair of the bones.

To these deformities, inevitable by any method of treatment, the use of immobilizing apparatus adds the stiffness that so often develops during the course of immobilization. The treatment by regulated movements takes no account of certain insignificant deformities, whose existence will not in the slightest degree affect function, but leave the limb throughout the course of the treatment thoroughly supple, absolutely painless, and in all its pristine vitality. Finally, it may be added that movement does not cause inflammation and immobilization does not prevent it.

I have had the satisfaction quite recently of seeing my method of treatment of fractures as developed for human beings confirmed on animals. Monsieur Trouette, a skilled veterinary surgeon of Algiers, has shown that bony repair takes place in large animals very well in spite of movement. Monsieur Cagny has reported that in the dog repair of fractures takes place unsatisfactorily if the limb is rendered immobile; repair is satisfactory, however, when a regulated amount of movement is allowed. The bones of dogs repair badly only when there is forced movement of the animal.

The effects of the application of this new method of treating fractures are of the highest importance in the surgery of the bones, which is one of the most important parts of ordinary surgical practice. The advantages obtained are briefly these. The callus formation is more rapid and more certain. Pain disappears early in the treatment. The original pain of the injury is not succeeded by the

secondary discomfort which is so common when apparatus is employed. The rapid disappearance of the muscle contraction is the most efficacious means to prevent the displacement of the fragments which is so often dependent on this contraction. The suppleness of the limbs and their complete vitality are preserved. Muscular atrophy is reduced to a minimum and often fails to appear at all when the passive movements are practised from the beginning.

Whenever it can be employed, then, this new method of treatment should be given the preference. If it be not employed from the beginning, it is almost needless to say that the method loses a great part of its value. There are fractures that can always be treated by this massage and movement,—for instance, all fractures of the upper part of the humerus as far as the insertion of the deltoid muscle, fractures of the lower part of the humerus as far up as a hand-breadth above the elbow, and fractures of the elbow, especially those that involve the olecranon process of the ulna. The disappearance of contracture of the muscles for this last form of fracture has such an excellent effect that bony repair takes place with perfect coaptation of the fragments. I have never had an occasion, though I have looked for it many times, to practise suture of the olecranon.

Other fractures that may be treated by this method are those of the radius at the wrist in the great majority of cases. In all cases with radial fracture where slight deformity exists, the deformity should not be corrected too carefully, but should be allowed to remain. Massage and movement therapy is especially suitable for most cases of fracture of the clavicle. Fractures of the fibula should be treated by this method also, except in the rare cases in which there threatens to be a deviation of the axis of the foot. Even bimalleolar fractures of the foot, in which there is no deviation, may be treated without apparatus. I may also add that these are forms of fracture in which the most satisfactory results are obtained. It is very well known, on the other hand, what serious conditions develop at times in these double fractures as the result of the stiffness produced by immobilizing apparatus.

Fractures of the femur near the knee-joint without any turning back of the fragments and fractures of the upper part of the tibia do well when treated by this method. In all the cases enumerated my practice is to treat the fractures with a minimum of

apparatus, and this is replaced by slight supports after the first days.

These are the most usual fractures met with in practice. Other fractures are sometimes suitable for treatment by this method, but only in favorable cases can apparatus be dispensed with. Fractures of the humerus, for instance, in the middle of the shaft, fractures of both bones of the leg, or of both bones of the forearm usually require apparatus; this should, however, even in these cases be removed for a certain length of time each day, so that the treatment is without immobilization properly so called.

The technic of the treatment without apparatus of patients suffering from broken limbs or the still more difficult cases in which massage and passive movements are combined with the use of apparatus is infinitely more difficult than the treatment with irremovable apparatus. Patients left to themselves under the new method of treatment will often have unsatisfactory results. The active and intelligent intervention of the physician should be sedulously kept up, and it is only by this constant care that we can benefit the patient in the way that I promise.

Passive movement is so often the primary condition for good repair of broken bones that certain patients are able to support only the movement without massage.

Children have such an irritability of the nervous system and are apt to be so excitable when bones are injured that this method of treatment is often contraindicated for them. Besides, in children the tendency after bone fracture is rather to the production of excessive callus, so that in most cases it is well to abstain from massage and to be content with daily passive movements methodically and regularly performed. I have used this method of treatment in children with very good satisfaction in fractures of the forearm and the upper extremity of the humerus and for various forms of fractures of the clavicle.

It is also advisable, as a rule, not to employ massage in old patients, because their blood-vessels are often thickened, the interior coats of their veins are roughened, and emboli and thromboses may occur. This advice is perhaps a matter of excessive prudence. I have never seen any bad results myself and none have been reported. With regard to fractures of the neck of the femur, it is advisable that they too should be treated without massage and

by passive movements alone. I recently treated very successfully a fracture of the neck of the femur in a woman of more than eighty years. Often in these cases I employ massage.

It may be seen from this classification of fractures that by far the majority of broken bones can be treated with this new method. I may even add that in cases that seem unfavorable to the application of this method, we are still able to apply certain portions of the technic of the method with distinctly beneficial results.

I am bound to say, however, that in cases where the reduction of the fracture has been difficult or where there exists a tendency to the production of considerable deviation, I use apparatus and put it on with great care and rigorous exactness. I consider that the best chance for the patient lies in the application of apparatus under chloroform, and it is only in this way that the best results are obtained. In these cases I have often employed massage during the chloroform narcosis.

For fractures of the shaft of the femur I employ exclusively Hennequin's apparatus, which really permits a certain amount of movement, and I consider this one of the reasons why its application is so commonly successful.

Compound fractures are not among those which can be treated by massage and passive movements from the beginning. As soon as cicatrization of the external wound has taken place, however, massage and movements should be begun. The risk of infecting the tissues is too great before cicatrization, but this is the only reason for delay in the employment of the method. Irremovable dressings should not be employed in these fractures, and the condition of the external wound should be watched carefully from day to day, so as, if possible, to prevent an infectious process from getting under way, and also to begin the massage and movement therapy at the earliest practicable moment.

When fractures are complicated by luxations, massage and passive movements are especially indicated. Massage of the part gives relief of pain and relaxes the spasm of the muscles, the two symptoms which are so particularly annoying to the patient and the physician in these cases.

In a large experience I have never seen any harm result when the physician was reasonably attentive to his patient. The eventual results are much surer than in cases where the fractures are put

up in apparatus and are hidden away from the surgeon's eye for days and sometimes weeks at a time. My experience with the treatment of fractures by this method has been sufficiently large to justify my speaking authoritatively in regard to its results, remote as well as immediate. Practically all the fractures that for the last five years have been admitted to the wards of my service at the Beaujon Hospital and the Hôtel Dieu (in Paris) have been treated in this way. They represent many hundreds of cases.

These have included fractures of most of the bones of the body. There have been, for instance, over one hundred and thirty cases of fractures of the radius treated almost exclusively without apparatus by immediate massage and subsequent daily passive movements. There have been twenty cases of fracture of the olecranon treated exclusively by this method. There have been over fifty bimalleolar fractures of the leg, most of them treated without any apparatus, but simply by position, movements, and massage. There have been over sixty fractures of the clavicle treated, without fixation apparatus of any kind, simply by position, massage, and passive movements. In fractures of the clavicle this method gives better and surer results than any of the well-known fixation methods.

In conclusion, I may say that the time has come when we should treat fractures rationally, and not in accordance with the old tradition that has no true basis in practical surgery, and that we adhere to only for fear of being blamed for bad results if they occur when traditional methods are not employed.

TREATMENT OF SIMPLE ULCER OF THE STOMACH.

CLINICAL LECTURE DELIVERED AT THE PITIÉ HOSPITAL.

BY ALBERT ROBIN, M.D.,

Physician to the Paris Hospitals.

GENTLEMEN,—The subject chosen for lecture to-day may be somewhat of a surprise to you, as your minds probably revert at once to the classical treatment of this disorder, prescribed by Cruveilhier in 1830,—the absolute milk diet. While this treatment has often been criticised, it has been so generally adopted by practitioners that to-day it is almost impossible to separate the idea of the disorder from that of this treatment.

It must be granted that a method which for seventy-two years has withstood all attacks and has earned the approval of successive generations must possess undoubted merit. Like all my confrères, I myself approve of it, use it, and advise others to do the same. But after long experience, physicians have concluded that it is desirable to institute a preliminary and preparative treatment that did not enter into Cruveilhier's original plan. This is why I have selected this subject. I shall also refer to some other forms of treatment for this disorder, which, during the last few years, have been considered favorably as a substitute for the milk diet. Finally, the modern side of the question shall be discussed, that of surgical intervention.

The fundamental indications on which is based the treatment of to-day are not difficult to remember. They are four: prophylaxis; treatment, properly so called; treatment of the predominating symptoms; and treatment of the many complications that arise during the course of the disorder.

PROPHYLAXIS.—Simple ulcer being the result of hypersthenic gastritis with hyperchlorhydria, the treatment of the latter condition is naturally the prophylaxis of ulceration, the details of which treatment are already well known.

TREATMENT, PROPERLY SO CALLED.—When the diagnosis is

unmistakable, the first indication is absolute rest of the stomach. This permits the wound to heal and diminishes stimulation to secretion, which is one of the essential elements of the gastric juice. Absolute rest of the stomach is therefore of first importance, though the patient must, meanwhile, be sufficiently nourished by appropriate means.

As a preliminary, the patient should be put to bed and heating compresses should be applied to the epigastrium. For this purpose there can be used a large towel dipped in hot water and covered with oiled silk or cotton wool, all kept in position by means of flannel bandages. The patient must be warned to keep absolutely quiet. This accomplished, all food and drink are denied, nourishment being administered by enemata into the rectum. Careful experiment has been made in various laboratories regarding this method of feeding, and it has been proved that if it be skilfully handled, a patient may be placed under absolute gastric rest for a comparatively long time.

The treatment should be prescribed in the following manner: each day the patient should be given four alimentary enemata, and two others of water for quenching the thirst. The latter are designed not only to supply the body with the amount of water it may need, but to remove from the rectum any alimentary residua it may contain.

These enemata should be distributed through the day as follows: on awakening in the morning, a simple enema of two hundred and fifty cubic centimetres of water at from 28° to 32° C.; about an hour later the first alimentary enema should be administered. The formula that I am accustomed to using for the latter consists of two or three eggs beaten up with two tablespoonfuls of peptones, to which are added one hundred grammes of twenty per cent. solution of glucose. A second beating is given and from one and one-half to two grammes of salt are added (according to the number of enemata), and a few drops of laudanum. This gives a liquid volume of one hundred and fifty cubic centimetres to one hundred and sixty cubic centimetres which the patient should retain as long as possible after it has been injected.

An enema of one hundred and twenty-five cubic centimetres to one hundred and fifty cubic centimetres is usually quite well tolerated. At any rate, the patient can become gradually accus-

tomed to the method by giving upon the first day only one enema of food and two or three of water, to be followed on the second day by two of food; on the third by three, and on the fourth day by four.

If the rectum be found very passive or the patient be very weak, the four enemata of food may be administered upon the second day or even upon the first. The second enema of water is generally given about four o'clock in the afternoon.

The only obstacle to be met with in endeavoring to obtain absolute rest for the stomach through these enemata is rectal intolerance. Some patients cannot stand them. My experience has shown the proportion to be about one in fifteen; other physicians have only found one in twenty-five or thirty. It will thus be seen that while they do exist they are not very numerous.

When this condition is found, it is first best to see whether toleration cannot be secured by a slight increase of the proportion of laudanum, raising it to twelve or fifteen drops a day. In some cases it will be advisable to substitute paregoric for the laudanum, the former acting in the same way and appearing more efficacious with certain patients.

This done, try removing from the enema formula the substances that are more apt to give rise to rectal intolerance, namely, the salt and the peptones. By these means, it is possible in about fourteen cases out of fifteen to overcome the difficulty and carry out the rest cure for the proper length of time.

This length of time varies somewhat in the experience of different practitioners. Two physicians of Lyons who have paid special attention to the question say that their gastric rest cure never lasts less than fifteen days, and, in some instances, is prolonged even to thirty days. They claim that their patients only lose slightly in weight, even during this protracted period, dropping from one to three kilogrammes. In my own experience the average length of time has been nine days, never having gone beyond twelve days, and sometimes having stopped at three or four.

The signs which will indicate whether the rest cure has reached its limit are persistent rectal intolerance, bodily weakness of the patient, and the fact that the cardinal symptoms of the ulcer have not yielded to the action of the treatment. Under these circumstances you will be obliged to desist.

Finally, there will be found a certain number of patients with whom rectal feeding can be advantageously replaced by hypodermic feeding. The latter question was very cleverly treated at the Medical Congress recently held in Paris. The conclusions now adopted by all practitioners were then reached. It was decided that hypodermic feeding is in no way able to replace feeding by the mouth (which fact is obvious) nor even that by way of the rectum; that by its means the albuminoid substances are only absorbed with the greatest difficulty, which fact gives rise to pain and frequently to accidents; and that the only substances that may be injected hypodermically without drawback and with the certainty of their being absorbed by the system are oils and solutions of glucose. With certain patients one of the physicians previously mentioned succeeded by combining hypodermic and rectal feedings in prolonging the rest cure. But my own experience has not been such as to warrant my recommending this method, especially since, as a general thing, rectal feeding will suffice. The hypodermic method, therefore, would best be regarded as a theoretical idea held in reserve for some special case.

In the majority of cases it will be found that under the influence of the rest cure all the symptoms of the disorder decrease; the gastric crises, the sensitiveness of the epigastrium, etc., disappear. The loss in weight is small. In fifteen patients treated by myself it varied from five hundred to two thousand grammes. As a general rule, when a patient is found to be losing from five hundred to six hundred grammes a day, counting from the beginning, it is time to stop the rest cure as soon as possible, if the symptoms which led to its institution have improved. If, however, the patient has had copious vomiting of blood, the rest should be carried through the nine days.

As soon as the rest cure is ended, the milk diet must be introduced, which is the fundamental treatment of the disease. The first day, one of the alimentary enemata should be replaced by one hundred grammes of hot milk taken in small quantities by the mouth; the second day two enemata should be thus replaced; the third day for three enemata should be substituted three meals of one hundred and fifty grammes each; and on the fourth day enemata should be abandoned, the patient taking four meals of two hundred grammes each.

Upon the fifth day the quantity of milk should be increased to a litre, and during the following days the quantity should gradually reach three litres, given in six doses of five hundred grammes each, at intervals of three hours, from seven A.M. to ten P.M. After this it should be increased by fractions of twenty-five grammes until forty-two hundred grammes are reached. The patient should follow this *régime* as long as he can tolerate it and the increase in weight continues. In any case, he should not stop for at least six months.

Then comes the task of bringing the patient back to ordinary diet by progressive stages. On awakening, at eleven A.M., at four P.M., and at seven P.M., he should take a half-litre of milk, the quantity thus omitted to be replaced by vegetable food at the meals occurring at eleven A.M. and seven P.M. At these the milk should be taken as a beverage. The meals themselves should consist of milk-soups prepared with semolino, tapioca, and arrow-root, and of vegetables cooked in water and dressed with a little fresh butter at the moment of eating. Farinaceous food is specially to be recommended, particularly rice, which is admirably tolerated. As dessert, the patient should eat cooked fruit, such as prunes or baked apples; and very little bread should be allowed.

In about two weeks the second stage of the transition period begins. Instead of milk at meals, pure water is given, partaken of by the patient at his will. Bouillon, the beef of *pot-au-feu* (well boiled and very tender), and roast veal or chicken in small quantities, thoroughly cooked and minced, may all be permitted. Eggs are not only permitted but advised. There should be but two meals, at eleven A.M. and seven P.M. In the morning and at four in the afternoon milk alone should be taken.

After a week of this *régime* the patient may go back to an ordinary diet. But it must be borne in mind that such patients are hyperchlorhydric and cannot follow the diet of ordinary people. For years their diet should be carried on strict lines.

Food permitted: All meats, poultry, and game, provided they be roasted, well done, and finely cut up or very slowly masticated, and without any sauce. All fish, provided they are not cooked in grease, are boiled, are without sauce, and are seasoned with a little salt or lemon-juice (the latter advised for such patients); eggs in

the shell; vegetables cooked in water and seasoned at the table with a little fresh butter; cooked fruit.

For liquids the patient should use nothing but plain water or slightly mineralized spring water, such as Évian or Alet. After each meal should be taken a small cup of hot, aromatic infusion, such as coffee or weak tea of chamomile or mint.

Such are the fundamental indications of what may be called the systematic treatment of gastric ulcer, which requires seven or eight months. In the majority of cases the patients are radically cured; nevertheless, a certain number, about one in four, require supplementary treatment. These can be divided into two distinct classes. One class shows a certain amount of nervous asthenia, and in some cases even an actual neurasthenic condition; the other, signs of more or less pronounced anæmia through lack of hæmoglobin.

There is a special treatment for each of these classes. For the anæmic patients the best remedy is iron. But since the congestive action of this remedy might well be feared for patients subject to gastric hemorrhage, the perchloride only should be prescribed, given in pills of ten centigrammes in the middle of meals. This preparation is both reconstituent and hæmostatic, and lessens, to a certain degree, the secreting habit of the gastric mucous membrane.

With patients suffering from nervous asthenia an arsenical treatment is most successful. Formerly, I obtained good results with intrarectal injections of arsenic, but since the introduction of sodium cacodylate into therapeutics, I use the latter preparation in hypodermic injections. For eight consecutive days a dose of five centigrammes is given. Then follows eight days' rest. After these comes another series of injections followed by another period of rest, until forty days have elapsed. Sodium cacodylate gives remarkable and often unhoped-for results; in the most serious cases accompanied by cachexia, its use sometimes preventing the necessity for surgical intervention. It is also efficacious in cases of any pronounced anæmia.

Let us now briefly review a few methods of direct medication that have been advocated during the past few years as substitutes for Cruveilhier's treatment.

The first method, advanced by Fleiner, has a great reputation

in Germany. It consists of using bismuth subnitrate as follows: a certain quantity of this substance is introduced into the stomach by means of a catheter and is allowed to remain there a certain length of time, the patient being made to vary his position so that the bismuth is brought into contact with the ulcer and acts as a dressing. This done, the bismuth is extracted again.

The amount of bismuth used is sometimes enormous, reaching as high even as two hundred grammes. The minimum is twenty grammes. I cannot approve of this treatment on account of the danger in using the gastric catheter with this class of patients. There are other treatments which I regard in the same light for the same reason, such as washing out the stomach with nitrate of silver, perchloride of iron or even with water.

In the use of sodium bicarbonate, which has been also recommended, the catheter is not necessary. The idea seems rational, and as high as sixty grammes have been given per day. I think that this method is also a mistake, since it is well known that alkalies stimulate the secretion of hydrochloric acid. This acid causes abundant intestinal secretions, which are alkaline. It will be found that in those patients who have been treated with large doses of sodium bicarbonate, the period of lesions in hyperchlorhydric gastritis develops with the greatest rapidity and certainty.

Finally, there has been advised a species of artificial Carlsbad water composed of the folllowing:

℞ Sod. bicarb., 2.0 grammes;
Sod. sulph., 1.0 gramme;
Aq. dest., 1000.0 grammes.

This solution is administered in increasing doses, from a glass to a litre. But in my experience nothing can be compared in efficacy to the methods previously described.

Two points are now to be discussed: first, the treatment of the predominant symptoms,—pain, vomiting, constipation, and diarrhœa; second, that of the complication of the disorder, and particularly hæmatemesis.

Treatment of the Predominating Symptoms.—Pain always accompanies gastric ulcer, but it may reach such a point of persistence and paroxysm as to require special treatment. Again, vomiting may become such a feature as to warrant the term "vomitive form," formerly given to such cases. This also requires special

treatment. In other patients will be found stubborn constipation which requires particular treatment because it favors a hyperchlorhydric condition. Occasionally, a profuse diarrhœa will require attention.

These symptoms will now be considered in detail.

1. *Treatment of Pain.*—We must first distinguish between the permanent pain at the epigastrium and the acute attacks occurring during digestion from the hydrochloric acid secreted.

At one time this pain may appear as pyrosis, at another as colic, at a third as a painful cramp. The principal cause of this distress being eating, the absolute rest previously described is the best treatment for both pains and gastric crises. But when, the rest cure completed, the pains still attend digestion, the simplest remedy is four drops of the following:

℞ Picrotoxin,
Morphine hydrochlorate, āā 0.05 gramme;
Atropine sulphate (neutral), 0.01 gramme;
Ergotin, 1.0 gramme;
Cherry-laurel water, 12.0 grammes;
Alcohol, q.s. to dissolve the picrotoxin.

Sig.—To be given five minutes before each meal (or each bowl of milk, if still on milk diet).

The dose may be increased, but should not exceed twenty drops a day.

This preparation produces a sufficient insensibility of the stomach to lessen the irritation of the contact with milk or solid food. Consequently, it is a prophylactic treatment for the crisis. When, however, the latter occurs in spite of the drops, there should be given immediately a powder that will take up completely and at once the excess of acid which causes the distress. The following formula is best.

℞ Lactose, 1.0 gramme;
Calcined magnesia, 1.50 grammes;
Bismuth subnitrate,
Prepared chalk, āā 0.70 gramme;
Codeine, 0.005 gramme;
Sodium bicarbonate, 1.0 gramme.

Sig.—For one powder, which should be taken in a little water as soon as the pain is felt. The distress usually stops in about five minutes.

If these means fail, recourse would better be had to preparations of belladonna or cocaine, formulated as follows:

℞ Belladonna powder,
Belladonna extract, āā 0.01 gramme.
Sig.—For one pill; give from one to three pills in twenty-four hours.

℞ Lime water, 150.0 grammes;
Chloroform water, 50.0 grammes;
Cocaine hydrochlorate, 0.03 to 0.05 gramme;
Codeine, 0.05 gramme.
Sig.—In tablespoon doses.

External applications should be used, such as the following:

℞ Baume tranquille,[1] 40.0 grammes;
Extract of opium,
Extract of belladonna,
Extract of hyoscyamus, āā 2.0 grammes;
Chloroform, 10.0 grammes.

This preparation, applied to the epigastrium, often gives excellent results where other treatments have proved insufficient.

2. *Treatment of Vomiting.*—When the symptom vomiting is manifestly exaggerated, give before meals five drops of the picrotoxin mixture previously prescribed. This will probably stop the trouble. If not, apply to the epigastrium a blister three-quarters to one and one-half inches in diameter. When the epidermis has been removed, powder the raw surface with ten centigrammes of opium. Lastly, advise large inhalations of oxygen gas. All these means failing, there is nothing left but for the patient again to return to absolute gastric rest.

3. *Treatment of Constipation.*—When constipation is present, laxatives and frequent rectal irrigations will be necessary. The latter are given by means of a large urethral catheter (No. 29 French) whereby a litre or one and a half litres of warm water can be injected into the intestine. The liquid having been injected very gently into the sigmoid flexure, the patient should be subjected to a series of manipulations which will make the liquid penetrate into the different parts of the large intestine. He should first lie with the head quite low, so that the liquid will flow into the descending colon; then lie upon the right side; and finally stand up so that the liquid will flow into the rest of the colon.

The abdomen should then be subjected to light massage, in order to set free the matter accumulated in the intestine. After

[1] A compound oil balsam of the French Codex.

a rest of about ten minutes, the manœuvres described should be reversed. When the liquid has been returned to the rectum the patient generally has an imperative desire for a movement of the bowels. Great stress is to be laid on the importance of conducting these irrigations with gentleness and of using no unnecessary pressure. When the usual method is employed, the bag should not be placed more than five or ten centimetres above the body, as the smaller the pressure the better the effect, and the patient should take a copious rectal injection each morning in the same way.

Laxatives are also required because this irrigation does not reach the small intestine. Saline purgatives are to be avoided, because, on account of their osmotic effect, they generally increase the constipation. Still they do not induce hemorrhage.

Of the laxatives that are most useful and free from danger there are three to be specially recommended. First, castor oil, given in two or three capsules in the morning, the dose to be repeated every day until the trouble is overcome. This will generally produce two or three stools a day, which will be sufficient.

In case, however, the castor oil induces vomiting or colic, recourse must be had to the second or third remedy.

Of these calomel comes first, and is excellent if given as follows:

℞ Calomel,
Jalap, āā 0.30 gramme;
Calcined magnesia, 1.0 gramme;

making one wafer. As these wafers should be freshly prepared, a more convenient remedy will be found in the following:

℞ Aloes,
Scammony resin,
Jalap resin,
Vegetable turpeth, āā 1.0 gramme;
Extract of hyoscyamus,
Extract of belladonna, āā 0.15 gramme;
Excipient, q.s.
Mix and divide into fifty pills.

Be careful to specify "vegetable turpeth," to avoid confusion with *mineral* turpeth, a sulphate of mercury which would produce vomiting and constipation. The former is supplied by a Japanese plant, and its action is similar to jalap.

One or two of these pills should be taken either before the

last bowl of milk or at bedtime, two hours after eating. They will be sufficient to keep the bowels in a satisfactory condition, particularly if irrigation is practised every day, as previously described.

4. *Treatment of Diarrhœa.*—This symptom is unusual, but when met with it must be promptly checked. A most efficient remedy is an infusion of one and a half grammes of powdered wild strawberry root. As the preparation is harmless, the dose may be repeated as often as deemed necessary, its effect being due to the tannin it contains.

Treatment of Complications.—The most serious of all complications is hemorrhage. When this feature is found, the patient should at once be placed motionless upon his back and an ice-bag should be applied to the epigastrium. Inject immediately, upon one side of the abdomen, a gramme of fresh ergotin, and on the other twenty cubic centimetres of gelatin solution, according to the following formula:

℞ Pure gelatin, 20.0 grammes;
Pure NaCl, 7.0 grammes;
Distilled water, 1000.0 grammes.
Dissolve and sterilize.

Give every hour a tablespoonful of the following:

℞ Bonjean's ergotin, 4.0 grammes;
Gallic acid, 0.50 gramme;
Turpentine syrup, 30.0 grammes;
Distilled water, 120.0 grammes.

Every hour between the successive doses of the foregoing should be given the following:

℞ Eau de Rabel, 48.0 grammes;
Syrup of opium, 50.0 grammes;
Distilled water, 250.0 grammes.

The eau de Rabel contains one part of sulphuric acid to three of alcohol. When it causes pain, substitute the following:

℞ Calcium chloride, 4.0, 5.0, and 6.0 grammes;
Opium syrup, 30.0 grammes;
Distilled water, 120.0 grammes.

The property of calcium chloride is to increase coagulation of the blood.

Meanwhile empty the large intestine by copious irrigation.

All the foregoing is immediate treatment for emergency, but at the slightest sign of hemorrhage the patient should be put upon absolute gastric rest for not less than nine nor more than fifteen days.

Other complications may follow gastric hemorrhage. Should syncope occur, injections of ether are indicated, as well as saline solutions in quantities of fifty, sixty, or one hundred grammes or more. Should the patient's temperature rise, it is a sure sign that a portion of the blood from the hemorrhage is being retained in the intestine. As this may cause poisoning, the patient should be purged at once with calomel given according to the previous formula.

Finally, if the hemorrhage is very profuse, if possible, make transfusion of blood. Its effects are sometimes magical.

The cure complete and the usual routine of life resumed, the patient is sometimes very weak and anæmic. For this prescribe perchloride of iron, but it should not be taken for more than a week. Follow with protochloride of iron, which is less irritating and gives similar results.

Comparison between the Medical and the Surgical Treatments of Gastric Ulcer.—This subject will be discussed under the headings of hemorrhage, perforation and its consequences, perigastritis, and stenosis of the pylorus.

1. *Hemorrhage.*—Though statistics show that fifty per cent. (and even more) of the cases operated upon for hemorrhage prove fatal, it does not follow that laparotomy should be absolutely condemned. While it is undoubtedly useless in large hemorrhages that quickly prove fatal, it is of benefit in the small, recurring hemorrhages that defy medical treatment. Fortunately, but a small percentage of the cases of gastric ulcer come in this class.

2. *Intestinal Perforation.*—In this phase there is little hope but in surgical intervention, though rest and opium may be of some benefit. Bear in mind, however, that the fatal cases reach thirty per cent.

3. *Subphrenic Abscess.*—This accident (one of the consequences of perforation) always requires an operation. Though statistics collected show twenty-nine fatal cases out of forty-four, I still unhesitatingly advise it. It is the only means of combating

the evil, recovery through prolonged rest having but one case to show in its favor.

4. *Perigastritis.*—The ulcer may be accompanied by a neighboring induration that simulates carcinoma. But, while a tumor now may be felt in the epigastric region and functional disturbance is extreme, close study of symptoms and conditions reveals no sign of cancer. In such cases circumstances must guide decision. A patient with leisure to devote to medical treatment will require no operation.

5. *Pyloric Stenosis.*—There is a distinction between stenosis caused by cicatrix and that due to functional spasm; the kind can be decided by a milk diet. In the latter, the signs of stenosis will disappear in eight or ten days; in the former they not only continue but increase. Under such conditions, gastro-enterostomy will give most satisfactory results, and not more than ten to fifteen per cent. of such operations prove fatal.

Thus, while surgical treatment responds to certain very definite indications, it is not always necessary, though some writers have recently advocated what they term the *radical cure* of gastric ulcer. But as simple ulcer, treated medically, recovers in from eighty-five to ninety-one per cent. of the cases, its death rate is but nine per cent, while that of surgical treatment is twenty per cent. For this reason the radical cure should be absolutely abandoned.

To sum up in a few words:

1. In simple ulcer without complications, never advise surgical treatment.

2. When there are complications, one of two conditions will be present:

(*a*) There is more or less hemorrhage. If copious, use medical treatment only. If slight, but persistent and medical means fail, resort to surgery.

(*b*) Surgical treatment is necessary in the following cases: intestinal perforation, subphrenic abscess, pyloric stenosis if cicatricial, perigastritis in persons whose means will not permit long and expensive medical treatment.

TWO CASES OF IMMEDIATE DEATH CAUSED BY THE SPINAL INJECTION OF COCAINE.

BY F. LEGUEU, M.D.,
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I do not wish to be the one to appear as reopening the discussion that has just taken place in the Surgical Society of Paris on the question of the special use of cocaine; but as I have recently lost two patients by this method, I feel that it is my imperious duty to publish this unfortunate complement to the remarks that I then made.

I have lost two patients only a few minutes after the injection, and on the operating-table; we are, therefore, no longer dealing with *tardy* cases of death, occurring some time after the operation, and in the explanation of which we could conscientiously discuss the part due to the patient's disorder. The cases of immediate death that I have had leave no doubt as to the influence of the cocaine.

I do not think that there is any criticism to make in my two cases, either as regards the injection or the amount of cocaine used. In one case the injection was made by one of my interns in my presence, and in the other by the chief of clinic, into the third or fourth lumbar space, according to the technic that I am in the habit of using; it was made slowly, and the quantity used was two centigrammes or less.

I ascertained that the substance employed was in reality cocaine of good quality. I had it analyzed, and it was pronounced all right; besides, both before and since, the same solution has given me the good results that I published in my paper.

As regards the patients, however, there are some extenuating circumstances, as you will see.

On July 30 a man aged fifty-four was brought to the Hôtel Dieu with a rupture of the tendon of the left triceps. On the previous day, at two in the afternoon, as the patient was walking

in the street, he suddenly became giddy, lost consciousness, and fell to the ground; in this condition he was picked up and carried home. In a few hours he came to and got up, although suffering with his left leg, and with the help of a cane went down into the cellar. There he was again seized with an apoplectiform attack, fell to the ground, and remained unconscious the entire night; the following morning at about six o'clock he was found lying on his back, still in a coma. He was then carried upstairs, put to bed, and soon regained consciousness, whereupon he was brought to the hospital.

I saw him the following morning, July 31; he was sitting up in bed. had recovered all his senses, and showed no signs of paralysis. On examining him, I found in the left leg a rupture of the tendon of the patella at its lower insertion, and advised him to have it sutured. But when the question arose as to the anæsthetic to be employed, this patient's general condition caused me some uneasiness. He was heavy, even obese, with a congested and apoplectiform appearance and with emphysematous lungs; the heart sounds were dull, there was a galloping rhythm at the point, and the arteries were atheromatous.

I was not at all disposed to give this patient chloroform, as during my period as house surgeon I had lost a patient on the operating-table who was in no worse condition than this man. I felt that he was just the sort of subject to die under chloroform. I mentioned my apprehensions to my assistants, but we also felt that the case was a pretty bad one for cocaine. I decided, however, in favor of the latter, and I admit that I was wrong. The operation took place on August 1. The puncture was made in my presence by my house surgeon, and the first attempt only brought blood; the second, however, brought, after aspiration, limpid spinal fluid, which seemed to flow with difficulty, drop by drop. An injection was made of a little less than two cubic centimetres of a one per cent. solution, and the patient was laid on the bed; the operative field was then prepared, while I finished washing my hands.

I began the operation about ten or twelve minutes after the injection; the patient was quiet; said nothing and felt nothing. Suddenly, when I had opened the joint and was removing the clots with which it was filled, the patient complained of suffocation,

asked to sit up, and groaned a few times. He was raised in bed, and then, after several convulsive movements of the head, fell back dead with his face quite black. This took place three or four minutes after the beginning of the operation, or about a quarter of an hour after the injection.

I should have been glad to have been able to make a post-mortem, which would have been very instructive; but permission was refused, and I had to rest satisfied with the clinical data which I have just mentioned.

With the exception of the feeling of sadness that one always experiences on losing a patient from an anæsthetic on the operating-table, I think I can truly say that this case did not trouble me much. We were so convinced of the gravity of the circumstances, and had so fully discussed beforehand the pros and cons of these two methods of anæsthesia,—chloroform and cocaine,—that the fatal result was really not a surprise. I felt that I was to blame for not having fully realized that this patient's atheroma and cerebral congestion contraindicated the spinal use of cocaine, I was provoked with myself for not having used chloroform, and on the whole I was convinced that the blame was more mine than that of the anæsthetic agent. I therefore continued to have recourse to the spinal method with other patients, and with satisfactory results.

A few weeks later, however, a second accident occurred to interrupt the series of our operations, and this one gave me more cause for reflection, although I did not observe the mishap myself, as it happened one Sunday when I was away, and I did not see the patient either before or after the occurrence. I mention this, not to lessen my responsibility, the whole of which I assume, but to explain the fact that the data in my possession are acquired from other persons.

On the 8th of last September a man aged sixty-one was brought to the Hôtel Dieu with a strangulated inguinal hernia; strangulation had already lasted forty-eight hours, and although the hernia was not a large one, the patient's general condition was critical.

This man had only vomited once, the day before, but his face was gray, nose drawn, lips discolored, hands and feet cold and clammy, voice weak, and tongue dry; the pulse was small and quick—about 140—and the temperature slightly subnormal. In a

word, all the general symptoms denoting a very tight strangulation existed in the most marked degree. The patient made such a bad impression on the nurse who saw him first that she remarked to the woman who accompanied him that he would possibly not be operated on at all.

My chief of clinic and intern were called, examined the patient, and noticed the violence of the general reaction that had taken place; but since on several occasions we had operated by means of cocaine on patients in just as bad a state, and since up to this time we had considered such a condition as an indication for the spinal injection rather than otherwise, my chief of clinic made a lumbar injection of one and a half centigrammes of the one per cent. solution in the third space. The liquid came out drop by drop, the injection was made slowly, and nothing special was noted.

The region for the operation had just been washed and prepared when it was noticed that the patient was breathing with difficulty, and he then vomited twice; his face was pale and his forehead covered with sweat, and immediately afterwards his breathing became very slow. Two injections of ether were made and oxygen was given, but respiration stopped entirely, and death occurred without a struggle or cry, the patient's face being as pale as wax. From twelve to fifteen minutes had passed since the injection had been made and six to seven since the unfavorable symptoms had begun. The operation had not been commenced; in fact, loss of sensation had not been obtained when death took place.

I directed that a post-mortem should be made, and the following data were handed to me by the house surgeon.

There was a strangulated inguinal hernia containing a loop of the small intestine with a little omentum, but no lesion either of the intestine or of the walls of the sac.

The heart was of normal size, but its tissue was rather flabby. On being opened, the muscle was found normal, the cavities contained neither clot nor liquid, the mitral valve was in an excellent condition, with the exception of two small patches of atheroma at the base of the large valve, the bicuspid valve healthy, pulmonary sigmoids healthy, and aortic sigmoids slightly atheromatous at their base. The aorta was not dilated, and there was a moderate-sized oval patch of atheroma fifteen centimetres distant from the aortic

orifice. The opening of the coronary arteries was quite free, their tissue was soft, and these vessels were permeable throughout their entire course.

The lump showed old adhesions of the upper portion of the two pleura. The left lung was slightly congested in its lower portion, but still crepitated everywhere; in the upper part a chalky tubercle was found. The right lung showed more marked congestion, though crepitating everywhere at the post-mortem; still, a certain number of congestive foci could be seen,—dark, raised infarcts on section, from which dark blood could be pressed out. These recent infarcts crepitated and floated in water. There were six or eight of them about the size of walnuts in the two lower lobes and one somewhat larger in the upper lobe. There were a few calcified tubercles at the apex, and in the middle lobe a large and more recent tubercle surrounded by a fibrous shell.

There was a marked degree of tracheo-bronchial adenopathy, but formed of small, separate glands, none of the masses being sufficiently large to warrant the suspicion of compression of the pneumogastric.

The liver and spleen were normal, the kidneys rather small, slightly contracted, but capsule peeled readily; the cortical substance was reduced to six or eight millimetres. The left kidney showed two cysts about the size of an orange when put together; the right kidney contained a cyst the size of a small peach. Histological examination, however, disclosed no serious lesion.

The brain showed strong adhesion of the dura mater to the cranium, but no meningeal or cerebral lesion, external or internal. The arteries were particularly supple and permeable, and no lesion of the medulla oblongata, cerebellum, or its peduncles could be detected.

In a word, in this post-mortem the only interesting points were that the heart stopped in systole, and was free from clots; the pulmonary lesions were recent and of no importance; while the kidneys showed cysts, but no signs of nephritis on microscopical examination.

Under these conditions uræmia cannot be considered as contributing to the fatal result; in any case, it would be a very rapid form of uræmia occurring in a quarter of an hour from an injection of one and one-half centigrammes of cocaine! Uræmia

would be more likely to explain a case of death in a few hours, with headache, persistent vomiting, etc., due to a lack of elimination of the cocaine.

It is, therefore, probable that this patient died from syncope caused by the direct and immediate action of cocaine on the medulla oblongata.

Here are, then, two cases of *immediate* death, the only ones, I believe, of this kind due to the spinal injection; so that in a few weeks the death-rate from this method in my hands was raised to one per cent. This is very high for an anæsthetic; and though I may be a victim of an unfortunate coincidence, I have felt it my duty to abandon the method for the present. But I cannot set aside the benefits that hitherto I have derived from the use of cocaine, and it is only just to say that until these two deaths occurred I had never had any serious trouble with those injections; and I believe that in my series of patients there were some who owed their lives to the substitution of cocaine for chloroform.

In conclusion, I do not wish to be understood as condemning *in toto* the spinal use of cocaine; on the contrary, I believe that it will remain as a method of anæsthesia confined within certain limits. There are indications and contraindications with which we are yet unfamiliar. In the case of my first patient the atheroma and cerebral congestion with which he was threatened were in all likelihood contraindications that I was wrong in disregarding. With my second patient the renal lesions found at the post-mortem were unimportant, so that I cannot in fairness look upon them as a contraindication.

Whatever the explanation may be, facts such as those given above will be of great value to surgeons making use of the spinal method, and will cause them, I hope, to be very prudent in their choice of patients as well as in the amount of cocaine administered.

SELECTED PRESCRIPTIONS.

PERSISTENT DIARRHŒA IN THE TUBERCULOUS.

One of the most annoying and exhausting symptoms of tuberculosis, especially in advanced stages, is persistent diarrhœa. This is often intractable to all ordinary remedies. The following prescription is said to give satisfactory results in cases where other means have failed.

℞ Ichthoformi, ʒss;
Tannalbin.,
Bismuth. subgall., āā ʒi;
Codeinæ, gr. iss;
Ol. menth. pip., ɱiss.
M. et divid. in chart. No. vi.
Sig.—One powder every three to six hours, according to indications.

TREATMENT OF RHUS POISONING.

Grindelia robusta locally and internally is thought by some to be a specific; hence the following prescription.

℞ Ext. fluid. grind. robustæ, fʒiv;
Aq. menth. pip., fℨi;
Aq. rosæ, q.s. ad fℨiii.—M.
Sig.—Apply freely on cloths.

Internally the supposed specific effect of the grindelia may be obtained by the following preparation.

℞ Ext. fl. grindeliæ robust., fℨi;
Aq. cinnamom., q.s. ad fℨii.—M.
Sig.—Teaspoonful three or four times a day.

For cases with few lesions yet considerable discomfort, lead-water and laudanum has been employed with excellent satisfaction.

℞ Plumbi acetat., ʒss;
Tr. opii, fℨss;
Aq. dest., q.s. fℨviii.—M.
Sig.—Apply externally as lotion or on cloths.

As for most troublesome skin eruptions, ichthyol has been recommended. Its color impresses the child's mind and at least helps

by suggestion to make the subjective symptoms less complained of. It may be prescribed as follows:

℞ Ichthyol., ʒii;
Aq. destil., fʒiv.—M.
Sig.—Apply externally every four to six hours.

HAY FEVER.

Krause has recently recommended the use of trichloracetic acid for this. He has found it of great service in a number of cases. Improvement takes place almost immediately, and complete relief of the troublesome symptoms usually within a week. It may be prescribed thus:

℞ Acid. trichloracet. solut., one per cent., fʒii.
Sig.—Snuff gently into the nose three or four times a day.

BRONCHITIS IN THE OLD.

For the cases of chronic bronchial catarrh in the old, which are quite as apt to prove annoying in the summer as in the winter, Dr. Burney Yeo recommends the following combination.

℞ Ammon. carbonatis,
Sodii bicarb., āā gr. xl;
Tinct. opii camp., fʒiv;
Spt. chlorof., fʒiss;
Infusi senegæ, q.s. ad fʒviii.—M.
Sig.—Two tablespoonfuls every five or six hours in hot water.

The water used should be quite as hot as it can be borne comfortably. To give the remedy in lukewarm water will surely induce vomiting, which is not intended, and will make the remedy not only disgusting to the patient but harmful.

MORNING APPETIZER FOR BRONCHITICS.

In those who suffer from chronic bronchitis with free secretion there is often a disinclination for food in the morning. This is due to a collection in the stomach of mucus swallowed during the night. Plain water will not remove the accumulation, but an alkaline solution of common salt will help materially in dissolving it and so preventing it from clinging to the gastric walls. For this the following prescription is of service.

℞ Sodii chlor.,
Sodii bicarb., āā ʒii.
M. et divid. in chart. No. xii.

Sig.—Dissolve one powder in a bouillon-cup of water as hot as can be borne, and take half an hour before breakfast.

VISCID BRONCHIAL SECRETION.

For cases of chronic bronchitis in the old or in those affected by emphysema the main difficulty is often the racking, prolonged cough required to bring up the stringy, adhesive mucus, which, despite its large amount, is often quite viscid in character. For the relief of the discomfort which this occasions the New York Polyclinic formula for chronic bronchitis is known to be very effective.

℞ Ammon. carbonat.,
Potassii iodidi, āā fʒii;
Spt. æther. comp., fʒiss;
Syr. pruni Virginian., q.s. ad fʒiii.—M.

Sig.—Teaspoonful after meals and, if necessary, at bedtime.

This remedy, far from being unpleasant to the taste, has a bouillon savor that is very satisfying to most patients. The breakfast can be taken afterwards with a relish.

COLDS IN OLD PEOPLE.

For the slight colds often seen in the aged, even during warm weather, the main indication is for a stimulant expectorant that will disturb the stomach as little as possible. Much better than the ordinary ammonium carbonate preparations under these circumstances is the following formula, which has been extensively used with satisfaction.

℞ Spt. ammon. aromat., fʒi;
Spt. chlorof., fʒii;
Aq. menth. pip., q.s. ad fʒiii.—M.

Sig.—Teaspoonful every four hours.

STRICTURE.

A non-surgical treatment for this condition would be most welcome to patients and their medical attendants. Bazy, the French genito-urinary specialist, who is well known for several distinct contributions to his specialty, announces that he has obtained some relief of symptoms in stricture cases, before the contraction of the urethra has become occlusive, by the use of the following ointment.

℞ Potassii iodidi, ʒi;
Lanolini,
Ung. aq. rosæ, āā ʒiv.—M.
Sig.—Rub into the perineal region daily for five minutes.

ANGINA.

The following capsule is said to be very effective in persistent forms of angina that recur after temporary relief has been obtained by the use of pearls of amyl nitrite. The capsicum favors rapid absorption; the castor oil seems to have a like effect.

℞ Nitroglycerin, gr. $\frac{1}{100}$;
Amyl. nitrit., gr. $\frac{1}{4}$;
Menthol., gr. $\frac{1}{50}$;
Oleoresin. capsici, gr. $\frac{1}{100}$;
Ol. ricini, ♏x.—M.
For one capsule.
Sig.—Take when pain recurs.

In the treatment of angina ordinary sweet spirit of nitre, which is so often at hand as a domestic remedy, has been overlooked. It is rapidly absorbed, as a rule, and in a very short time produces a marked fall in blood-pressure, and this is the main indication for the relief of the pain in angina. To an adult a tablespoonful may be given at a dose, and it will be found to relieve the discomfort not only of true angina due to some pathological change in the heart muscle or its blood supply, but also of the pseudo-angina due to disturbance of the nervous mechanism of the heart.

ACUTE RHEUMATISM.

Prof. George Dock, of Ann Arbor, recommends the following prescription for acute rheumatism.

℞ Sodii salicylat.,
Sodii carbonat., āā ʒii;
Aq. camphoræ, q.s. ad f ʒ vi.—M.
Sig.—One tablespoonful in water every hour.

He considers that any form of nephritis, either acute or chronic interstitial, constitutes an absolute contraindication to any form of salicylate treatment.

MUSCULAR RHEUMATISM.

For this the salicylates are seldom of any benefit, and even then give only temporary relief. Gentle rubbing and mild counter-

irritation are always indicated. The following formula has given great satisfaction in French hospitals.

℞ Spt. camphoræ, f ℥iss;
Spt. terebinth., f ℥iss;
Chloroformi, f ℥ii;
Menthol., ℥i;
Bals. Peru., f ℥iss.—M.
Sig.—Apply with gentle friction.

EPILEPSY.

The following formula for the administration of the bromides in epilepsy is recommended by Dr. Gilles de la Tourette, and is used very commonly at the famous La Salpêtrière Hospital for nervous diseases in Paris.

℞ Potassii bromid., ℥x;
Sodii bromid.,
Ammon. bromid.,
Sodii benzoat., āā ℥iii;
Aq. destil., Oii.—M.
Sig.—As a beginning dose take one tablespoonful after breakfast and at bedtime.

The dose should be increased so as to control the seizures. If the epileptic attack recurs at a regular hour each day, two-thirds of the daily amount should be given an hour before the time of the expected attack.

EMULSIONS OF BROMINE FOR EPILEPSY.

It seems to be well established that when watery solutions of bromides are not well borne by the stomach emulsions of pure bromine may often be given with excellent results. Dr. L. Pierce Clark, of the Craig Colony for Epileptics, suggests the following formulæ.

℞ Olei sesami, f ℥ix;
Bromi puri, ℥i.—M.
Sig.—A tablespoonful night and morning, increased until seizures are lessened.

℞ Olei sesami, f ℥viii;
Acaciæ (granulat.), ℥ii;
Syrupi, f ℥ii;
Ol. gaultheriæ, ♏LX;
Aq. destillat., f ℥vi.
Misce et fiat emulsio et adde
Bromi, ℥ii.
Sig.—Tablespoonful night and morning, increased as indications require.

℞ Acaciæ (pulv.), ℥ii;
Olei sesami (vel ol. morrhuæ), f℥viii;
Aq. destillat., f℥vi;
Ol. gaultheriæ, f℥i.
Misce et fiat emulsio et adde
Bromi, ℥ii.
Sig.—A tablespoonful night and morning, increased as directed.

℞ Acaciæ (pulv.), ℥ii;
Olei sesami (vel ol. morrhuæ), f℥viii;
Aq. destillat., f℥vi;
Ol. gaultheriæ, f℥vi.
Misce et fiat emulsio et adde
Bromi, ℥ss;
Potassii bromidi, ℥ii.
Sig.—Tablespoonful night and morning, increased as directed.

ACNE ROSACEA.

Dr. J. Nevins Hyde recommends for the first grade of acne rosacea local treatment by means of very hot water and one of the following applications.

℞ Sulph. præcipitat., ℥i;
Pulv. camphoræ, gr. v;
Pulv. tragacanthæ, gr. x;
Liq. calcis,
Aq. rosæ, āā f℥i;
Misce et fiat lotio.
Sig.—Apply locally after bathing the parts in hot water several times a day.

℞ Sulph. præcipitat., ℥i;
Ung. aq. rosæ, ℥i.
Misce et fiat unguentum.
Sig.—Bathe the affected parts well in hot water and apply locally twice a day.

ACUTE NASAL DISCHARGE.

In acute forms of rhinitis with irritating mucoserous discharge, the following sprays will be found to be grateful to the patient and to lessen the discharge.

℞ Ac. carbolici, gr. i;
Menthol., gr. i;
Ol. gaultheriæ, ♏i;
Liq. petrolat., ℥i.—M.
Sig.—Use as a spray four or five times a day.

CHRONIC NASAL DISCHARGE.

In long-standing cases of nasal discharge due to chronic rhinitis, especially when of watery character, the following formula should be used.

℞ Ol. caryophilli, ♏viii;
Terebeni, ♏xx;
Liq. petrolat., fʒi.—M.
Sig.—Use as a spray three or four times a day.

EYE-WASH.

Instead of the simple solution of boric acid, which patients neglect to use as directed because it seems too simple to be of much service, the following eye-wash has been recommended for uncomplicated acute conjunctivitis, and will be found even more soothing and satisfactory than the simple boric wash.

℞ Sodii biboratis, gr. v;
Ac. borici, gr. x;
Aq. rosæ,
Aq. destillat., āā fʒi.
Misce et fiat solutio.
Sig.—Drop freely into each eye every two or three hours, or use eye-cup.

ANTISEPTIC MOUTH-WASH.

So many proprietary preparations to be used as mouth-washes are on the market and are being pushed so sedulously on the physician's attention that most doctors will be glad to be able to prescribe an efficient mouth-wash without the necessity of having recourse to some much advertised preparation. The following formula, from *Merck's Report,* would seem to fill all the requirements of an antiseptic yet not unpleasant or unpalatable solution.

℞ Formalin, ♏v;
Tinct. benzoini, fʒiii;
Tinct. myrrhæ, fʒi;
Ol. menth. pip., ♏iii;
Ol. anisi, ♏ii;
Ol. cassiæ, ♏i;
Ol. cinnamomi, ♏xv;
Alcoholis, fʒii.—M.
Sig.—Use as mouth-wash once or twice daily.

BLACK EYE.

Ecchymosis of the lower lid—so-called "black eye"—can be somewhat lessened by the prompt application of cloths wrung out of ice water and continued for from six to ten hours. The remedy is used more faithfully if a slight addition of lead and alcohol is made to it.

When a definite clot has formed, the skin should be incised or two or three leeches applied to the orbital margin. When the

true "black eye" has fully developed, a few days later, the discoloration may be concealed by means of flesh-colored paint, which is easy to obtain for this purpose.

VARICOSE ULCERS.

The *Journal of the American Medical Association* recently recommended the following dusting powder for the treatment of leg ulcers resulting from broken-down varicose veins.

℞ Iodol., ʒiv;
Zinci oxidi, ʒii.—M.
Sig.—Dust freely upon the ulcer.

The dressing should be changed every other day.

For obstinate ulcers that have resisted other methods of treatment this is recommended.

℞ Ichthyol, ʒi;
Gelatinæ, ʒii;
Zinc. oxidi, ʒi;
Glycerini, fʒiii;
Aq. destil., fʒss.—M.
Sig.—Heat the preparation and paint on the ulcer, first cleansing the sore parts with an antiseptic solution and then drying.

PROPHYLAXIS OF VARICOSE ULCERS.

Two precautions are extremely important: the avoidance as much as possible of standing (walking is not near so harmful) and of constipation. When the presence of a tender spot shows the preliminary tendency to break down, the tissues should be gently soothed yet stimulated by a lead and opium wash, which is to be applied gently on a cotton-swab night and morning. A bandage should be worn.

UNIVERSAL PRURITUS.

This occurs not infrequently in elderly persons as a consequence of arteriosclerosis. Not much can then be done to relieve it except to assist kidney elimination, for the retention of excretory products in the system is often the cause of the peripheral nerve sensitiveness. For pruritus due to functional nervous disturbance, use:

℞ Ac. carbolici, ʒss to ʒi;
Glycerini, fʒi to fʒii;
Vini Xerici, q.s. ad fʒiii.—M.
Sig.—One teaspoonful after each meal.

Medicine

PACHYMENINGITIS HÆMORRHAGICA AS A CAUSE OF DRUNKARDS' DEATHS.

CLINICAL LECTURE DELIVERED AT THE GERMAN UNIVERSITY OF PRAGUE, AUSTRIA.

BY PROFESSOR ARNOLD PICK,

Director of the District Insane Asylum of Prague and Professor of Nervous and Mental Diseases at the German University of Prague.

GENTLEMEN,—The abuse of alcoholic stimulants is so common to-day that even unusual conditions which develop as the result of an excessive use of alcohol have a special interest for the medical practitioner. In recent years pachymeningitis hæmorrhagica interna—a thickening of the inner layer of the dura mater, with the production of pathological conditions which easily give rise to hemorrhagic effusions into the dural sac—has come to be a well-known result of this abuse. Not infrequently the fatal termination in drunkards is brought about by this hemorrhagic effusion and the pressure it produces upon the brain.

These cases have a special interest because the condition of pachymeningitis hæmorrhagica may develop without the production of significant symptoms or patients may have failed to consult a physician for the symptoms thus produced, and so there may be no suspicion of the existence of pachymeningitis in a given case. From this circumstance may arise medicolegal complications. In old cases of alcoholism very slight injury, ordinarily not calculated to produce any serious results, may induce a fatal hemorrhage within the brain case. Suspicious circumstances may thus point to violence when there has really been only a spontaneous hemorrhage, and innocent persons may be suspected of crime.

Pachymeningitis hæmorrhagica is, then, a very practically interesting condition, and the case that I shall show you to-day will, I think, prove of suggestive value in your study of the disease. The

patient, a man forty-two years of age, was brought to the clinic some days ago in a semi-unconscious condition. At the time he gave the impression of great lassitude, his answers to questions coming only after long delay and by extremely slow intellectual processes. For the moment he was not able to give much information and evidently did not realize his condition. In general, however, his answers to questions with regard to himself were more or less correct. It was clear that speech was difficult and that expressions came to him only after earnest mental search. When attempting to walk he supported himself with his left arm on the bed. His right arm was evidently weaker than the other. When asked to show his tongue, that organ was projected distinctly towards the right; when asked to show his teeth, it was noted that his facial muscles acted unequally and that the right side was distinctly weaker than the left.

The following morning he seemed to be much less conscious of time and place than on the preceding day. Occasionally his answers were correct; more frequently, however, they were untrue, as was learned by comparison with his history gathered from other sources. But the most important change in his condition was the development of distinct paraphasia. For instance, he called the hand-bell an inkstand. When shown a ring, he could not tell its name, but said that it was used for writing; then he put it on his finger and called it a thimble. He recognized a key, calling it by its right name. Most other things he named wrongly. When asked to say the multiplication table, he could not even repeat the first part of it. He admitted that he could not read, nor could he write. He was only able to write his name, and that with difficulty. At first he misspelled and abbreviated his baptismal name, but after persevering effort he succeeded in writing it correctly.

The weakness of the right half of his body was very evident. Even a cursory examination showed the existence of slight paresis of the right facial muscles, deviation of the tongue towards the right, and paresis of the right leg. His knee-jerks were lively on both sides and ankle clonus was present on the right side. There was no fever; the pulmonary condition was normal; the eyes were also normal and the eye-grounds gave no assistance in diagnosis. The reflexes in the region supplied by the fifth nerve seemed undisturbed. The whole right side of the face appeared to have

suffered in its nerve supply. This was noticeable as well in rest as in movement. There was no true disturbance of sensation. The right upper extremity was distinctly paretic, while the right lower extremity was even more affected than at the previous examination. The Babinski symptom—the responsive hyperextension of the big toe when the sole is touched—was positive on both sides. Incontinence of urine and of fæces developed. In the afternoon the patient was still free from fever, but lay on his bed apparently unconscious of his surroundings. To force him to speak it was necessary to attract his attention energetically. Even then he uttered nothing more than an unintelligible murmur which only now and then contained definite words.

On the next day his condition seemed to have improved. Though the weakness of his right side seemed distinctly increased, his temperature was still 37° C. and no stiffness of the muscles of the neck was present. All objects presented to him he now took with the left hand. When he attempted to walk, his gait was of the hemiplegic variety. He failed to recognize objects and called them by wrong names. He still understood certain questions that were put to him, but evidently failed to comprehend others. Once, of his own accord, he said, "I do not hear." Whenever he attempted to walk, the patient manifested a constant tendency to fall towards the right, which gave us the impression that he was not able to see the space on his right hand. When his wife came to visit him once or twice during these days, he did not appear to recognize her. By the evening of the second day he was very torpid. There was a manifest difficulty in understanding anything said to him. His paraphasia was not so noticeable, but this was due mainly to the fact that his replies were limited almost entirely to such words as "Yes" and "No." His temperature was 37.5° C. (about 99.5° F.). There was no rigidity of the muscles of the neck.

The next day there was distinct rigidity of the right arm and leg. The patient did not seem able to make voluntary movements with these limbs, though he could use his left extremities reasonably well. His pupils were contracted, and his pulse was somewhat rapid. His temperature in the morning was 37° C., at midday 38.3°, and in the evening 38.6° C. (about 101.3° F.). By this time the patient was completely comatose, and his death took place rather suddenly about 6.30 in the evening.

The diagnosis of this case lay between purulent meningitis and pachymeningitis hæmorrhagica interna. I may here state that we were much more inclined to favor the latter diagnosis.

The autopsy was made the day after death. When the brain case was opened, there was complete confirmation of the diagnosis of pachymeningitis hæmorrhagica interna. Between the dural layer of the meninges and the arachnoid there was found a cavity consisting of two well-defined walls. This could be readily separated from the arachnoid, and was contained in a sort of sac in which was collected about three-quarters of a litre of dark blood. This sac-like lesion lay over the left cerebral hemisphere and was manifestly a source of cerebral compression. Instead of the usual convexity of the outer surface of the hemisphere, there was a shallow, trough-like depression. This affected all of the temporal part of the brain, with the exception of a peak-like projection of part of the left temporal cerebral region, about corresponding to the middle of the upper frontal convolution and about four square centimetres in size. The upper part of the left temporal lobes and the anterior half of the ascending frontal convolution were also involved. This trough-like depression was rather sharply defined and had a distinct edge. The peak-like projection in the upper frontal lobe of the left side (Fig. 1) was caused by the layers of the meninges adhering at this point to one another and to the inner table of the skull lying above them.[1] The inner surface of the skull was here eaten away by a luxuriant development of pacchionian granulations. The rest of the brain seemed to be without any pathological changes.

We have but little to add to the conclusions that must suggest themselves from the findings of the autopsy. The pathological picture is that of an exquisite pachymeningitis hæmorrhagica interna, with this peculiar conformation of the brain due to the compression to which it has been subjected by the hemorrhage into the dural

[1] With regard to this illustration, it seems but proper to point out that one does not find as distinctly marked as might be expected, from the description of the specimen in its fresh state, the compression of those parts of the brain subject to the pressure of the clot formed in the layers of the dura. This difference is due partly to the fact that, during the hardening process, some of the distinctions between compressed and uncompressed portions of the cerebral tissue have been obliterated. Besides, the brain was set in a glass vessel, and as a consequence of resting upon a flat surface all of the cerebral tissue has become somewhat flattened.

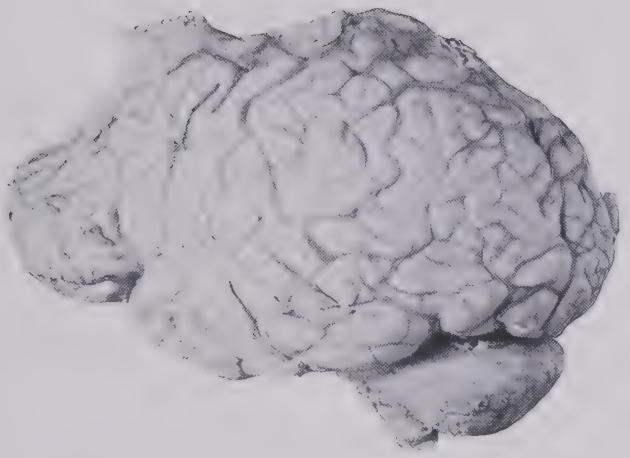

FIG. 1.—Pachymeningitis hæmorrhagica interna; frontal and temporal convolutions compressed by hemorrhagic lesion in dura; peak-like projection due to adhesions between brain substance and membranes and between membranes and inner table of skull.

sac. As a consequence of the adhesions between the layers of the meninges, the brain remained in one part entirely free from compression, and even after the autopsy there could be seen at this point a sort of tenpin-like projection, corresponding to an elevation of the brain above the level of the compressed brain surface all around it.

Our main interest in the case centred in the clinical symptoms which all practically developed under our eyes. If we take a comprehensive view of these symptoms, we see that on the first day there were already slight right-sided hemiplegia and beginning disturbance of speech. Within two days these conditions reached their acme, and on the last day were completely veiled by the widespread symptoms of pressure that had gradually been evolved. If we examine the speech disturbance carefully, we note that at first the main symptom was sensory aphasia accompanied by paraphasia. There was also interference with the faculty for reading and writing. Only later, but then without much difficulty, did we notice that motor aphasia was developing. At first the patient had a number of words at his command. His verbal treasury, however, became more and more depleted almost from hour to hour.

It would not be unfair to conclude that the peculiar projecting conformation which especially affected the posterior part of the left frontal convolutions had something to do with the fact that the motor aphasia developed later in the case than did the other symptoms. In reality, because of the absence of compression at this point, there was less interference with the motor speech centre than with the parts of the temporal convolutions in which intense compression was manifest. We might draw the conclusion, then, that in other cases in which this peculiar and surely infrequent conformation could not be suspected the development of the two forms of speech disturbance, sensory and motor aphasia, might be expected to run a more nearly corresponding course. As the result of compression the typical symptom would be an almost pure total aphasia.

This special case gave rise to a medicolegal investigation to determine the cause of death. In the course of the trial it became clear that the patient had been very much given to the abuse of alcoholic stimulants. In his early years he had been a gardener; later he was a plasterer. As to what infectious diseases he had

suffered from nothing was known. He was always a heavy drinker. When intoxicated he was ugly and quarrelsome. He scolded and particularly threatened his wife. When besotted with drink, he would sleep for a long time and then recover without remembering anything that had happened while he was drunk. In May of last year he got into a quarrel and received a sound drubbing. Last Christmas night he had a similar experience, so that he came home with blood flowing from his mouth and nose. He was in bed for a week at that time and complained of severe headaches. After that he was more careful in his habits and he has been less frequently under the influence of liquor.

On the day before he was carried home, the patient complained to his wife of severe headache. Nothing else seemed to be wrong with him. On the night before he had his stroke he tossed a great deal in bed, and on rising in the morning he trembled very much, so that he almost extinguished the lamp which he held in his hand. He went to work and did not return at noon.

What happened to him afterwards on that day could not be learned with accuracy. He must have fallen somewhere in the street, for he was picked up by the police and taken to the police detention rooms. A medical examination was made and there was a suspicion that the man might have met with foul play. He seems at that time to have suffered from convulsive movements, for in the official medical report certain involuntary movements of the arm and legs are mentioned, of which, however, as we have said, there was no sign when he was first examined in the clinic. These spasmodic movements would seem to have been due to irritation of motor centres when the clot first began to gather and before sufficient compression had been produced to cause paralytic symptoms.

The important diagnostic feature in the case is the history of alcoholic abuse to a marked degree, extending over many years. This must at once call attention to the possibility of the existence of pachymeningitis hæmorrhagica interna. A number of these cases have already occurred and the significance of the nervous symptoms, formerly so baffling, is to-day generally understood.

In the differential diagnosis one other pathological condition must be especially considered. The clinical symptoms point to an extensive lesion. The existence of total aphasia is, as a rule, due

either to bleeding into the dural sac, as in this case, or to softening in the region supplied by the arteria fossæ Sylvii because of the occurrence of a thrombus in that artery. Usually the thrombotic condition must be thought of first, as it occurs most frequently. This case, however, shows us how similar the two conditions may be. The gradual development of the symptoms in this case was the best indication of the occurrence of hemorrhage as the cause of the condition. It is not impossible to conceive of thrombosis of the arteria fossæ Sylvii developing so gradually that speech centres are put out of function one after the other. This would occur, however, very rarely, while in pachymeningitis hæmorrhagica gradual development is the rule, and the history of a case, even when it has been under the care only of those who are inexpert in the observation of nervous patients, would suffice to show it to be of comparatively slow progressive character.

Time relations are the most important symptoms in these cases and must furnish the ultimate basis for diagnosis. A hæmatoma of the dura will reach its acme in any given case in from twenty-four to thirty-six hours and the symptoms of severe compression will then become noticeable. The progressive thrombosis of the arteries of the Sylvian vascular region will be much more slow and without any accompanying symptoms of pressure. The prognosis as to length of life is, as can be readily understood, essentially different in the two conditions.

A third condition that must not be forgotten in the differential diagnosis of these cases of total aphasia is what English authorities call ingravescent apoplexy. This may give a symptom complex not unlike that which we have been discussing. In these cases the hemorrhages take place into the large basal ganglia or into the so-called claustral region, and slowly give rise to extensive destruction of tissue at the base of the brain. Of course it is easy to understand that our discussion involves only cases in which the more serious symptoms of an apoplectic attack have become somewhat less severe. It seems scarcely necessary to say that total aphasia may be produced by copious bleeding in the interior of the cerebral hemispheres or by pressure upon even distant parts of the brain. These cases, however, usually run a rapid course to their fatal termination, and exact localizing diagnosis, even if it were possible, would do very little to enable us to treat the patient more rationally

or with any hope of securing ultimate improvement in his condition.

In a previous clinic [1] I discussed with you a very striking case of total aphasia due to endarteritis chronica, with subsequent thrombosis of the arteries of the base of the brain. Besides, as is not unusual, they being terminal arteries, there was endarteritic obliteration of some of the end arteries of the Sylvian area. In that case the cause of the brain condition was syphilis, and the symptom complex is quite characteristic of syphilitic processes in nervous tissue. It is interesting to compare that case with the present one, in which the pathological condition is due to alcohol. They are typical examples of the fatal issues of the forms of degeneration induced by these sources of so much harm to the nervous system. The basal syphilitic endarteritis and the pachymeningitis hæmorrhagica may each be accompanied by a terminal stage of total aphasia, but the manner of development of the symptom complex in the two affections is quite different and distinctive.

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[1] INTERNATIONAL CLINICS, Eleventh Series, 1902, vol. iv. p. 163.

PSEUDOLEUKÆMIA WITH CHRONIC RELAPSING FEVER.[1]

BY HERMAN F. VICKERY, M.D.,

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GENTLEMEN,—Miss Margaret D., aged nineteen, a native and resident of Cambridge, entered the Massachusetts General Hospital May 19, 1901. The family history was excellent, as also were her own previous health and habits. The catamenia, which had been regular since the age of fourteen, had last appeared three months before admission. In August of 1900 she noticed swelling in both sides of the neck, which had steadily increased. In March, 1901, she caught cold, and a cough persisted until entrance. The sputum was white, without blood. She had grown pale, and her voice became weaker after the attack in March. There had been no œdema, hemorrhage, or diarrhœa. The patient was well developed, but not well nourished. She had lost about twenty-five pounds in one year,—from one hundred and twenty-two to ninety-seven pounds. The skin and mucous membranes were pale. The right pupil was slightly larger than the left, and so remained while the patient was under observation; both pupils reacted to light and accommodation, and the eyes were somewhat prominent.

The enlargement of the neck, already mentioned, on the left side was due to glands, and on the right to a solid mass extending from the mastoid to the lower third of the neck, surrounded by separately palpable glands. None of these were attached to the skin, nor was there redness, tenderness, nor fluctuation. Glands could also be felt in the left axilla and left groin. The teeth showed neglect.

Thoracic examination was negative, except for a soft systolic murmur, loudest in the pulmonic area, and presumably hæmic. The right and left radial pulses were equal, synchronous, regular, of low tension and small volume. The arteries were not hardened.

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[1] Read before the 1902 meeting of the Association of American Physicians.

Splenic dulness reached as high as the eighth rib, and the spleen could be just detected by palpation. The abdomen was flat and soft, and no normal masses could be detected in it. The various reflexes were normal.

The urine was of normal color, acid reaction, specific gravity 1016; of albumin there was the slightest possible trace; sugar, bile, and the diazo-reaction were absent; urea, 1.89 per cent. In the microscopic sediment a few uric acid crystals and an occasional abnormal blood-corpuscle were observed. The white cells at repeated examinations numbered, respectively, four thousand six hundred, four thousand two hundred, three thousand eight hundred, six thousand two hundred, and five thousand. Hæmoglobin was estimated at seventy, seventy, and sixty-five per cent.

The red blood-corpuscles numbered four million one hundred and twenty-eight thousand; no abnormal forms were observed. A differential count of five hundred white cells gave: polymorphonuclear leucocytes, 80.1 per cent.; large lymphocytes, 12.1 per cent.; small lymphocytes, 6.7 per cent.; eosinophiles, 1.1 per cent. No rose spots were observed. The Widal test was made twice, with negative result. The spirillum of relapsing fever was searched for in vain on three different occasions; no sputum could be obtained, after entrance, for examination for tubercle bacilli.

On July 9, at my request, an enlarged lymph gland was removed from the neck for examination. Dr. J. H. Wright reported that it consisted chiefly of "small nuclei closely packed together in a fibrillary stroma; the nuclei vary greatly in size, and among them are eosinophilic leucocytes; also scattered among the nuclei are large cells with large nuclei. *Diagnosis:* Mixed-celled sarcoma." On July 13 a tuberculin injection was made (one one-hundredth gramme, T. R.), with no reaction. The diazo-reaction, at first negative, was faintly present on June 14 and positive on June 29 and July 24. On May 26, when the temperature was 102°-103° F., a few râles were heard in front at the left apex, but unaccompanied by dulness or other signs. The râles did not persist. During the seventy-eight days which the patient spent in the hospital she experienced six febrile periods (see chart), each lasting six to eight days, with afebrile intervals of about equal length. During the periods of fever the neck was apt to be more swollen and tender, increasing in circumference at the level of the thyroid

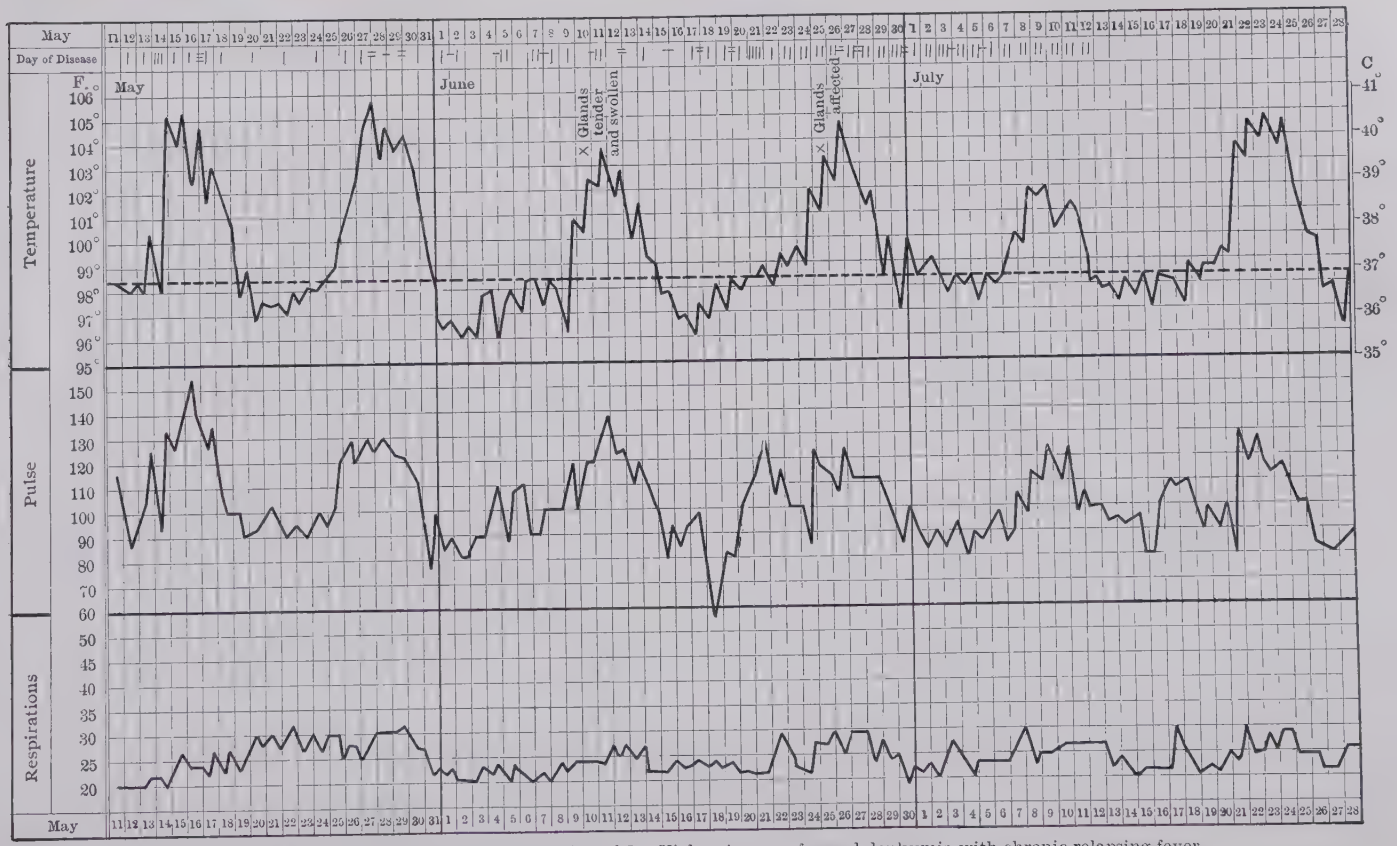

Chart showing temperature, pulse, and respiration of Dr. Vickery's case of pseudoleukæmia with chronic relapsing fever.

from thirty-two or thirty-three centimetres to thirty-six or thirty-seven centimetres. In the afebrile stage the patient gained somewhat, and was free from symptoms. She left the hospital July 28, her condition being unimproved. During the last week in August she had severe pain in the back and became more or less comatose, and after an illness of thirteen months she died September 1, 1901. There was no autopsy.

Etiology.—With regard to the etiology of this case, the following factors suggest the possibility of a tuberculous infection: Emaciation, chronic cough, a diazo-reaction, a hypoleucocytosis, and the presence at one time of râles at the left apex. On the negative side we have a favorable family history, the absence of any permanent thoracic signs, the absence of tuberculous sputum, the failure to react to tuberculin, and the microscopic appearances of the excised gland. Moreover, there was no hectic fever, and the temperature during the afebrile periods did not present the marked oscillations seen in most cases of tuberculosis.

Musser [1] has shown that pseudoleukæmia with recurrent fever may be associated with tuberculosis, but he has not, I think, established an essential connection between the two. W. Türk [2] states that he does not believe that pseudoleukæmia, as ordinarily described, indicates a single morbid process. Pel reported of his third case [3] that *postmortem* no trace of tuberculosis could be found. James B. Coleman [4] reports an acute case of Hodgkin's disease. During life the blood was stained and examined, and cultural experiments were made. After death various methods of staining were employed; also cultures were taken, and inoculations made into the peritoneal cavity of a rabbit. All these modes of examination had a negative result. Coleman's case was not of the recurrent febrile type, but if a part, at least, of the ordinary cases of Hodgkin's disease are non-tuberculous, it seems to me easier to believe that the cases with recurrent fever are due to some as yet unrecognized organism than that they are an extraordinary manifestation of tuberculous infection.

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[1] Am. Med., Jan. 4, 1902.

[2] Wien. klin. Wchnschr., Oct. 5, 1899.

[3] Berl. klin. Wchnschr., 1887, No. 35.

[4] Transactions of the Royal Academy of Medicine, Ireland, 1899, vol. xvii. p. 482.

CLASSIFICATION OF CIRRHOSIS OF THE LIVER.

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A CLASSIFICATION of hepatic cirrhosis may be made upon an etiological, a pathological, or a clinical basis. Schematism and over-refinement are often observed in the classifications made, yet it is difficult to formulate a division to include all varieties without some contradictions, either pathological or symptomatic. Accurate theoretical and pathological differentiation is important with reference to the therapy, as in syphilitic cirrhosis, in malaria, gout, diabetes, dyspepsia, lead poisoning, or other kindred causes, and, again, in the atrophic cirrhosis in the relief of which surgery now plays a constantly increasing *rôle*.

THE ANATOMICAL AND ETIOLOGICAL CLASSIFICATION.—Important as is the recognition of the etiological factor, clinical confusions arise if classification be made on this basis alone. Thus, for example, alcohol or tuberculosis may produce the fatty cirrhosis, or an atrophic cirrhosis may result from several causes, as alcoholism, syphilis, and malaria.

Chauffard, in Charcot's "Traité de Médecine," gives the following excellent anatomical and etiological classification:

(I.) *Vascular Cirrhosis.*—(*a*) Toxic: (1) by extrinsic poisons; (2) by intrinsic poisons. (*b*) Infective: (1) direct microbic infection; (2) indirect microbic toxic infection. (*c*) Dystrophic: (1) arteriosclerotic; (2) passive congestion.

(II.) *Biliary Cirrhosis.*—(*a*) By biliary retention. (*b*) By radicular angiocholitis.

(III.) *Capsular Cirrhosis.*—(*a*) By chronic localized perihepatitis; (*b*) By chronic generalized peritonitis.

(The letters indicate the etiological and the Roman numerals the pathological classification.)

THE PATHOLOGICAL CLASSIFICATION.—*The distribution of con-*

nective tissue is the point which is the most confusing of any connected with the differential pathology. Charcot drew such sharp lines between the different forms that, as Rosenstein has said, one might conclude that a glance through the microscope would readily differentiate them. Charcot described (1) *Cirrhose d'origine biliare,* (2) *Cirrhose d'origine veineuse,* and (3) *Cirrhose monocellulaire,* characterized by the presence of connective tissue between individual cells within the lobule, seen especially in hereditary syphilis.

The French school postulates the following differentia between the two types of cirrhosis: in the venous variety the connective tissue and inflammation extend around several lobules, sending connective-tissue processes late, if at all, into the lobule, hence a peripylephlebitis; in the biliary type the connective tissue begins in the lobule, around the smaller bile radicles, with increase in the biliary vessels, hence a primary angiocholitis or periangiocholitis. In the venous form the connective tissue exerts compression upon the lobule *en masse,* hence called *cirrhose multilobulaire s. annulaire;* in biliary cirrhosis the compression is in the lobule, hence denominated *cirrhose insulaire s. monolobulaire.* In the common cirrhosis the process is extralobular; in biliary it is extra- and intralobular. In the venous or portal type the liver is small, ascites is present, there is no icterus, and the liver cells are degenerated; in the biliary form the liver is large, ascites and other expressions of stasis are absent, icterus is the cardinal symptom, and the liver cells are intact,—a pathognomonic criterion.

Rosenstein rejects Charcot's and Hanot's terms, "intra- and extralobular," "multi- and monolobular," and asserts that there is no cirrhosis in which there are not some small lobules surrounded by connective tissue as well as many acini surrounded by connective tissue. Both distributions may occur in a single liver. In the annular and insular forms Rosenstein finds an actual histological differential point, and the concentric ensnaring of smaller or larger groups of lobules in typical cases of Laennec's cirrhosis are to him and Ackermann truly distinctive. In typical hypertrophic cirrhosis the connective tissue sends out processes into and around the lobules, now surrounding an entire lobule, now only certain cell groups. Rosenstein, Kelsch, and Wañnebroecq certainly overdraw the situation in saying that nearly all cirrhoses

are mixed types (*Type mixte* of Dieulafoy[1] and Guiter.[2] See also Sacharjin,[3] Goluboff,[4] Jakovleff[5]). Orth[6] refuses to divide cirrhosis into different types upon the distribution of connective tissue in regard to the lobule. When the tissue seems to surround lobules, the appearance is usually accidental. The same liver may show multilobular islets and large and small monolobular islets. Regarding the relation between parenchyma and interstitium, the same specimen may show at one point a sharp distinction and elsewhere the connective tissue running into the lobules. Orth regards all cirrhosis as essentially the same process. Hamilton also thinks Charcot's and Gombault's views extreme.

Brieger[7] and Sabourin[8] affirm that the connective tissue begins in the hepatic-vein zone. French authors find the connective tissue around the bile vessels, the veins being involved later and to a less extent. Hamilton says the secondary connective-tissue bands in the lobule are more numerous in biliary than in atrophic cirrhosis.

The Bile Ducts.—In general, the French authors describe a hyperplasia of the biliary passages in biliary cirrhosis. Brieger finds in every circumscribed connective-tissue formation in the liver an increase in the bile vessels in tuberculosis, carcinoma, adenoma, gregarinosis, distomiasis, and even in corset liver. Rosenstein states that he has found them (perhaps by accident) more frequently in atrophic than in biliary cirrhosis and cannot, therefore, consider them pathognomonic of biliary cirrhosis; also that they sustain no causal relation to icterus. The ducts are described as filled with degenerated and desquamated epithelium and less frequently with pigment masses. Rosenstein affirms the existence of this condition in the hypertrophic cirrhosis without icterus. Ackermann[9] thinks the new-formed bile vessels communicate with the smallest biliary vessels on the one hand, and with the main duct on the other, and gives as proof the results of artificial phosphorus

[1] Dieulafoy, Gaz. hebd. de méd., Sept.–Oct., 1881, Nos. 39, 40, 41, and 43.
[2] Guiter, De cirrhoses mixtes, Paris, 1881.
[3] Sacharjin, Klinische Vorträge, vol. iii., cases 7 and 8 (Russian).
[4] Goluboff, Ztschr. f. klin. Med., 1894, vol. xxiv. p. 353.
[5] Jakovleff, Deutsche med. Wchnschr., Nov. 8, 1894, p. 851.
[6] Orth, J., Lehrb. d. spec. pathologischen Anatomie.
[7] Brieger, Arch. f. path. Anat., 1879, lxxv. p. 94.
[8] Sabourin, Revue d. méd., 1882, 1883.
[9] Wagner, Virchow's Archiv., 1872, vol. lv. p. 11.

cirrhosis. Orth considers the canal system as due, chiefly at least, to atrophic liver cells arranged in rows, although he admits they may in part be neoplastic. They can be injected from the biliary system and are absent in no type of cirrhosis. This is also the view of Kelsch, Kiener, and Sabourin.

Friedlander[1] was the first to discover this reversion of atrophic liver cells to their embryonal duct-like condition. The ducts disappear where the connective tissue is most dense. According to Price,[2] the ducts are of two kinds: (1) true bile ducts; (2) duct-like structures continuous with and embedded in large tracts of fibro-nucleated tissue, being transformed into fibrous tissue. Small nodules on the surface are occasionally due to biliary polyadenomata. Ziegler[3] describes a bile-vessel proliferation in all cirrhoses.

In biliary cirrhosis proper the prime and initial lesion is an ascending infection from the intestines, which induces by its moderate yet constant irritation an interlobar desquamative obliterative angiocholitis, followed by hypertrophy of the liver cells, polycholia, and connective-tissue formation.

Character of the New-formed Connective Tissue.—Ackermann calls attention to the fact that the new-formed connective tissue in biliary cirrhosis remains uncontracted, hence the names *elephantiasis hepatis* (Eichhorst) and *L'hypermegalie* (Schachmann). In atrophic cirrhosis it is fibrous; in hypertrophic, embryonal in character (Rosenstein). Stadelmann remarks that the biliary cirrhotic liver never contracts. Orth admits that a biliary form exists, characterized by its clinical course and lack of atrophy, with the qualifying phrase that the future only can assign to biliary cirrhosis its exact status. Strümpell thinks the lack of contraction has been over-estimated, and that the organ would contract if life were prolonged. Hamilton describes the connective-tissue bands as finer in hypertrophic than in atrophic cirrhosis.

Condition of the Liver Cells.—That the liver cells preserve their form and integrity is characteristic of biliary cirrhosis. They are, at most, flattened only at the periphery of the lobule and may disappear. Fatty infiltration and necrosis are said to be very rare.

[1] Friedlander, Ueber Epithelwucherung und Krebs, 1877.
[2] Price, Guy's Hospital Reports, 1884, vol. xlii. p. 313.
[3] Sabourin, La glande bliiare, 1888.

The nuclei are preserved. The cells are sometimes pigmented or atrophied, but often both cell and nucleus hypertrophy and divide. In Laennec's form the cells are often degenerated, very frequently fatty, now in the centre, now in the periphery of the lobule. Hamilton says fatty degeneration is rare even in Laennec's cirrhosis, while fatty infiltration and hypertrophy occur. According to Schachmann, Hanot's cirrhosis is distinguished even from the biliary obstructive cirrhosis by the hypertrophy of the liver cells whose activity is increased (polycholia, *diabète biliare*).

Condition of the Blood-vessels.—The interlobular blood-vessels in the portal cirrhosis are diseased, while free in the biliary type (Rosenstein). The integrity of the hepatic or sublobular system is, according to Jaccoud,[1] quite exceptional. Ackermann distinguishes an atrophic cirrhosis (Laennec's) in which the cells die first and are replaced by connective tissue. According to him, Laennec's cirrhosis and one variety of large cirrhotic liver are the same, for in certain livers some parts are atrophic and others again are hypertrophic. Ackermann admits the identity of the French hypertrophic variety, which has, he states, nothing in common with the atrophic cirrhosis except the connective-tissue proliferation. It is apparently a primary connective-tissue hypertrophy with consequent atrophy of the liver cells, a hypertrophy occurring *around* the interacinous blood-vessels, *never* leading to characteristic granulations, producing *moderate or no stasis,—i.e., scanty ascites* and *insignificant splenic tumor,*—and occurring also in horses, fowls, and cattle, while the atrophic is seen in man only. The difference beween this form and Charcot's description is obvious.

The Clinical Classification.—Hamilton takes exception to the term "hypertrophy," arguing that an enlarged liver may be very atrophic. Liebermeister considers that the terms "biliary" and "hypertrophic" are not identical, nor are venous and atrophic cirrhoses the same. The portal-vein form usually shrinks and the biliary form usually enlarges; but exceptions occur, as (1) portal-vein forms remaining large till death or (2) biliary types atrophying to a certain degree. Most writers—*e.g.,* Strümpell—regard "biliary" and "hypertrophic" as synonymous, and "venous" and

[1] Jaccoud, Leçons de clin. méd., Par., 1885, p. 103.

"atrophic" as the same. The hypertrophic alcoholic cirrhosis of Hanot and Gilbert [1] is characterized by edges less sharp than normal; red or brown color; surface furrowed by uneven areas, varying in size, the unevenness being less than in the atrophic form; by granulations on the surface; by enlarged spleen, ascites, collateral circulation, etc. They assert that there are many transitional forms between it and the atrophic alcoholic cirrhosis, so that great importance does not attach to size alone. Recovery occurs in this more often than in any other form. Laennec seems to have known but one type of cirrhosis. Hanot, supported by Hayem, Cornil, and Charcot, insisted, even more than did Todd, upon the divorce of hypertrophic and atrophic cirrhoses. This separation of the two forms is the constant theme of the French school, but they do not seem concerned as to whether an enlarged liver may become small.

Cornil [2] was the first to discover a very rich network of bile vessels in the hypertrophic form, and upon this Hanot based his clinical division of cirrhoses into (1) the venous and (2) the biliary. Litten and Mangelsdorff sought to show that biliary was but the first stage of the common cirrhosis plus icterus. In Germany the different cirrhoses are largely held to be mere variations of a single fundamental cirrhosis. Stadelmann [2] voices this opinion when he declares his inability to find a difference between the two forms, because (1) there is a hypertrophic cirrhosis without icterus, (2) hypertrophic cirrhosis can later atrophy, and (3) icterus can be very marked in Laennec's cirrhosis. It seems to us that undue stress has been placed on size alone. An enlarged cirrhotic liver is by no means a hypertrophic cirrhosis.

A consideration of the possibility that the common hepatic cirrhosis may be preceded by hypertrophy is prerequisite. Todd [4] asserts that there is never preliminary enlargement in Laennec's cirrhosis, and he was unable to find in literature a reliable instance of a hypertrophic passing into an atrophic cirrhosis. Stricker

[1] Hanot et Gilbert, Soc. méd. d. hôp. de Par., May 30, 1890, vol. vii., third series, p. 492.

[2] Cornil, Arch. d. physiol., 1875, p. 265.

[3] Stadelmann, Verhandl. d. Cong. f. innere Med., vol. ii. p. 90.

[4] Todd, Clinical Lectures on Certain Diseases of the Urinary Organs and Dropsies, 1859, p. 113.

(Traube's clinic) observed livers shrink to half their former length in one month. Therefore, subacute and acute hepatitis must be excluded. Rosenstein [1] and Labadie-Lagrave [2] agree with Todd. Bright,[3] Budd,[4] Saunders, and Frerichs [5] have said that contraction is occasionally antedated by a stage of enlargement. Murchison's [6] experience taught that in a considerable proportion of cases of cirrhosis the liver is still very much enlarged, often from fat, after symptoms of portal obstruction have set in, and that patients often die in this stage with jaundice, hemorrhage, and symptoms of blood poisoning. Leudet,[7] from a pathological stand-point, comes to the conclusion that increase in liver volume is not always an index of a recent lesion, of an acute process, or a curable one. Murchison says it is questionable whether such livers would shrink if the patient lived longer, yet he states that increase and decrease in liver volume are probably different stages of the same process. Olivier [8] believed that cirrhotic atrophy and cirrhotic hypertrophy were different states. Gilbert and Hanot believe in the preliminary enlargement of cirrhosis atrophica. Semmola and Klebs have studied the disease in its incipiency and found that the organ is firm, smooth, and dark, with dilated portal radicles and periportal extravasation of round cells (Tissier). Keussner,[9] Rokitansky, Stadelmann,[10] Litten,[11] Schapiro,[12] Mangelsdorff,[13] Niemeyer,[14] Stricker, Strümpell,[15] Hamilton,[16] Orth, and Ziegler describe enlargement antecedent to atrophy. Bamberger considers the decrease in size of an enlarged liver almost pathognomonic for atrophic

[1] Rosenstein, Verhandl. d. Cong. f. innere Med., 1892, vol. xi. p. 65.
[2] Labadie-Lagrave, Maladies du foie, p. 557.
[3] Bright, Guy's Hospital Reports, First Series, vol. i. p. 612.
[4] Budd, Diseases of the Liver, 1845.
[5] Frerichs, F. T., Klinik der Leberkrankheiten.
[6] Murchison, Charles, Clinical Lectures on Diseases of the Liver, 1885, p. 145.
[7] Leudet, Clin. méd., 1874, p. 541.
[8] Olivier, Union méd., Sept., 1871, pp. 361, 400, 449.
[9] Keussner, Volkmann's klin. Vorträge, 141, p. 1192.
[10] Stadelmann, Verhandl. d. Cong. f. innere Med., 1892, p. 90.
[11] Litten, Charité-Ann., 1880, vol. vii. p. 173.
[12] Schapiro, St. Petersb. med. Wchnschr., March, 1891.
[13] Mangelsdorff, Deutsches Arch. f. klin. Med., vol. xxxi. p. 578.
[14] Niemeyer, Lehrb. d. spec. Path. u. Ther., 1874, p. 787.
[15] Strümpell, Lehrb. d. spec. Path. u. Ther., 1899.
[16] Hamilton, D. J., Text-Book of Pathology, vol. ii., pt. 1, p. 216.

cirrhosis. Rosenstein applies two tests, palpation of the liver's edge, continued clinical observation and necropsy—ascites, obstipation, or tympany render percussion most uncertain. With these criteria Rosenstein has never seen atrophy following hypertrophy.

Bile Stasis (*Icterus*).—Icterus dominates the clinical picture in the biliary variety. Most authorities admit that jaundice occurs more frequently in biliary cirrhosis, although it may be absent. Howard [1] found icterus in seventy per cent. of hypertrophic and in seventy-one per cent. of atrophic cirrhosis. Mangelsdorff found icterus in thirty-eight out of forty-nine cases of hypertrophic cirrhosis. Fogge (quoted by Charcot) found it in twenty-five per cent. of atrophic cirrhosis (one hundred and thirty cases) and Rosenstein in fifteen per cent. Icterus is absent in the *cirrhose hypertrophique graisseuse* (Sabourin). In Laennec's cirrhosis, it is incomplete, caused by compression of bile ducts by contracting connective tissue. Its frequency is variously given: seldom (Murchison, Oppolzer, and Charcot); frequent (Bamberger, Leyden, Furbringer); necessary to the diagnosis (Leyden [2]); slight in degree (Frerichs, Keussner); coming on before severe symptoms (Bright). In hypertrophic biliary cirrhosis some consider the icterus due to polycholia (Rosenstein, Labadie-Lagrave).

In atrophic cirrhosis, jaundice is a genuine complication, due to catarrh of the glands, or a diffuse cirrhotic process (Andral, *Clin. Med.*, ii.), yet few pass through the disease without a muddy yellow areola under the eyes. In hypertrophic cirrhosis the stools remain yellow, an important point,[3] yet sometimes they are acholic (Liebermeister). Stadelmann believes many of Charcot's cases of biliary cirrhosis were only instances of retention icterus (from calculi, cicatrices, etc.). Rosenstein has observed catarrhal icterus lasting between one and two years and has seen three cases of amyloid liver with icterus. In biliary cirrhosis the icterus varies directly with the fever curve and the size of the liver (Jaccoud).

Venous stasis is absent or inconsiderable in biliary cirrhosis, being terminal or complicating. It is present in the mixed forms (biliary plus venous). In advanced cases of atrophic cirrhosis, ascites is rarely absent, yet the patient may die before ascites de-

[1] Hayem, Arch. d. physiol. norm. et path., 1874.
[2] Leyden, Beitr. z. Path. d. Icterus, Berlin, 1866.
[3] Furbringer, Verhandl. d. Cong. f. innere Med., 1892, vol. xi. p. 121.

velops,—*e.g.,* from hemorrhage,—for hemorrhage is dangerous when there is no ascites (Leyden). An extensive, though slowly developing, collateral circulation may permanently relieve ascites. Ascites is no infallible sequence of atrophic cirrhosis (Lecorché, Hanot). It may disappear after hemorrhage (Fauvel), diarrhœa (Linas), or carcinoma of œsophagus (Lecorché, Talamon). It usually antedates œdema of the legs, although anasarca may appear first from (1) renal or cardiac complications, (2) compression of inferior vena cava, (3) perihepatitis involving cava, (4) cachexia, and (5) thrombosis of iliac veins. Splenic tumor is seen in both forms. Atrophic cirrhosis is accompanied by mechanical gastro-intestinal stasis with hypostatic hemorrhage. In biliary cirrhosis hemorrhage in other situations—*e.g.,* epistaxis—is more frequent. Furbringer has, however, observed in biliary cirrhosis, hemorrhagic gastritis and enteritis. The metabolic disturbances are the same in both forms, except that alimentary glycosuria is more frequent in the atrophic. In Laennec's type constipation is the rule; in biliary, diarrhœa. In both there occur dilatation of the right ventricle, leucocytosis, and remittent or intermittent temperature. Tubercular peritonitis and granular kidneys are common in the atrophic form, while rare in the biliary; in biliary cirrhosis, albuminuria is infrequent while a high pulse rate and a terminal cholæmic condition are usual.

All of us who have concerned ourselves with the classification of chronic nephritis have felt the tendency and often the necessity of using the simple term "chronic nephritis;" as, for example, in cases with cardiac hypertrophy, arteriosclerosis, and low specific gravity, with polyuria speaking for an interstitial nephritis, while the large amount of albumin and great number and variety of casts speak for considerable parenchymatous nephritis. Cases of mixed cirrhosis—*i.e.,* those with jaundice and stasis—are probably the cause of many clinicians diagnosticating "cirrhosis" and refusing to recognize the individual types. While mixed types of both nephritis and liver cirrhosis undoubtedly exist, nevertheless we would not wish to abandon the clear types of interstitial nephritis or parenchymatous nephritis, nor those of atrophic or biliary cirrhosis of the liver.

Rosenstein suggests three classes of cirrhosis: (1) The genuine contracted liver; the cirrhosis of Laennec, an analogue of the genu-

ine contracted kidney. (2) The hypertrophic icteric cirrhosis, an analogue of the parenchymatous nephritis. (3) The hypertrophic mixed form, in which hypertrophy and atrophy combine, an analogue of the secondarily contracted kidney.

Gilbert and Surmont [1] make the following classification:

(I.) *Biliary Cirrhoses.*—(*a*) Hanot's biliary hypertrophic cirrhosis. (*b*) Biliary cirrhosis due to obstruction of the bile vessels, with infection. (*c*) Experimental biliary cirrhosis due to ligature of the bile vessels and infection of the same. (*d*) Biliary cirrhosis in animals due to distomata, eggs of the nematodes, coccidium, etc.

(II.) *Vascular Cirrhoses.*—(*a*) From exogenous poisons, *e.g.*, alcohol, lead, phosphorus, etc. (*b*) From autogenous intoxications, *e.g.*, dyspepsia, gout, diabetes. (*c*) Infections of toxæmias, tuberculosis, syphilis, malaria, exanthemata, etc. (*d*) Arteriosclerotic; passive congestion.

(III.) *Lymphatic Cirrhoses.*—Capsular form; perihepatitis.

The classification we have suggested [2] is intended to include the principal conflicting clinical and pathological divisions, rather than to offer an infallible or as strictly scientific an arrangement of the varieties of cirrhosis of the liver as Chauffard's:

(I.) *Capsular Cirrhosis* (also known as Glissonian or lymphatic cirrhosis).—(*a*) Chronic perihepatitis; isolated or with chronic peritonitis. (*b*) Portal-vein syphilis (also vascular in origin).

(II.) *Vascular Cirrhosis.*—(*a*) Hepatic vein. (*b*) Portal vein. (1) Stasis cirrhosis (cyanotic induration). (2) Cirrhosis found in Laennec's cirrhosis, also Brieger and Sabourin, known as bivenous cirrhosis. (3) Laennec's cirrhosis or atrophic: first stage, pseudohypertrophy; second stage, atrophy. (4) Hypertrophic alcoholic cirrhosis, like Laennec's, only remaining large; fatty cirrhosis. (5) Cirrhosis from portal-vein syphilis and from pylethrombosis. (*c*) Arteriosclerotic cirrhosis.

(III.) *Biliary Cirrhosis.* — (*a*) Obstruction — "retention-icterus"—and cirrhosis. (*b*) Biliary or hypertrophic, in French sense. (1) With icterus; (2) without icterus. Hanot's cirrhosis.

(IV.) *Mixed Cirrhosis.*—Vascular (II.) and biliary (III.) varieties combined.

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[1] Gilbert and Surmont, Traité de méd. et thérap. by Bouardel and Gilbert.

[2] Edwards, A. R., J. Am. M. Ass., June 15, 1895.

HEPATIC SCLEROSIS; AUSCULTATORY PERCUSSION.

CLINICAL LECTURE DELIVERED AT THE RIVERSIDE HOSPITAL.

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GENTLEMEN,—The patient to whom I call your attention is a cutter of sheet glass. Glass-workers are among the best-paid artisans, enjoying high wages, comparatively short hours, and frequent vacations whenever the price of glass drops to what users consider a reasonable figure. Some branches of the trade involve pulmonary strain, exposure to high temperature, liability to chemical poisoning, inhalation of grit, etc.; but this patient has had an ideal employment. His family history is negative and he has been a total abstainer from alcoholics; his use of tea and coffee, always moderate, has been practically discontinued for a couple of years, and he has never indulged in the patent-medicine habit. He has led a correct, hygienic life, and until recently has enjoyed good health.

His complaint is vague, yet quite typical in the sense that few patients with his trouble present definite symptoms till late in the disease. Although not entirely well for a year or more, he experienced an exacerbation last spring and he is now in the midst of a similar exacerbation of two weeks' duration. Discomfort, sometimes amounting to actual pain in the epigastrium, free perspiration, rush of blood to the head, a feeling of nervous depression, never amounting to hysteria, are the most definite symptoms that can be elicited. The appetite, condition of bowels, etc., are normal, and he denies nausea and vomiting, gas formation, and genuine headache. In many patients of this kind we do find constipation, loss of appetite, and considerable belching, but, until late in the disease, seldom nausea and vomiting, except when the accumulation of endogenous poisons causes a sick headache.

Without a systematic examination a diagnosis would be impossible unless we dignify by this term such names as malaria,

neurasthenia, dyspepsia, etc. Vague as they are, this patient's symptoms call attention to the metabolic organs. The absence of respiratory symptoms excludes the lungs, for, so far as we know, there is no functional failure of external respiration, unaccompanied by obvious symptoms of disease. The lungs, moreover, are found normal physically. The circulation is connected with metabolism especially in a mechanical, distributory way. The heart is somewhat weak, about as weak as the man as a whole. It is free from murmurs or disturbances of rhythm, its area is normal by auscultatory percussion, and the apex beat and pulse are of a fair degree of force. The accessible arteries are soft, and there is no *arcus senilis* nor relative accentuation of the aortic second sound to suggest vascular changes.

A qualitative examination of the blood in the stained specimen excludes essential cellular disease. There may be a slight secondary deficiency of red cells and there certainly is a slight leucopœnia. I have made no effort to estimate hæmoglobin colorimetrically, for I regard such methods as so much guesswork; the only accurate method available is to determine quantitatively the iron in a considerable amount of blood, say ten cubic centimetres. The patient's condition scarcely warrants the trouble and expense of this method. There ought to be a clinical method of chemical examination of the blood. Think how much more important, for most purposes, is the chemical as compared with the microscopical examination of the urine, and reflect that the main value of this is the indirect conclusion that we may draw as to the state of the blood, for urine is no part of the body.

The lymphatic system, including the spleen, presents no significant enlargements, nor are there lymph stases,—that is to say, anasarca and serous dropsies. Note that in examining for ascites I not only palpate for the wave, but also attempt to determine it by the shock communicated to the stethoscope held in one flank while percussion—or, rather, succussion—is practised in the other. These two points, lack of lymphatic enlargement—including the spleen as a special form of lymph gland—and lack of lymph accumulation, are the extent of our diagnostic armamentarium unless we consider the blood examination as including the lymph, as it really does. There are no typical indications of involvement of the various ductless glands not connected directly with the lymphatic

system,—namely, the thyroid, pituitary, and suprarenal bodies. The thymus in a man of forty-seven is a dead issue.

This leaves to be considered the kidneys, liver, pancreas, and alimentary canal. The right kidney is very slightly movable, but not enough so to cause interference with its circulation nor reflex disturbance by mechanical insults to the sympathetic and vagus terminals. Microscopically, the urine is negative. Chemically, it is normal except for the presence of too much indican (which turns our attention away from the kidneys in the direction of intestinal putrefaction), and except also for a diminution of urea to eighteen grammes in twenty-four hours, all nitrogenous waste being estimated as urea. If the reduction were to ten or twelve grammes, we should question the functional if not the organic competency of the kidneys themselves, but a moderate reduction means either simply a reduction of ingesta and exercise or a failure of digestive power or of hepatic preparation of nitrogenous waste for elimination through the kidneys.

The pancreas seems to possess a resistance to disease commensurate with its importance to the body. Cancer, calculus, abscess, trauma, true diabetes, and fat necrosis are the only well-marked pancreatic conditions so far as our present diagnostic powers reach. There are no indications of any of these by palpation, history of colic, or results derivable from the examination of the urine and blood. Catarrhal and sclerotic diseases are not diagnosticable during life; neither is a functional disturbance—except of the islands of Langerhans, constituting a genuine but curable diabetes—or so marked a depression of digestive secretion as may lead a patient with, let us say, Addison's disease to starve to death in the midst of plenty and with plenty in his midst. This is partly because the pancreatic secretion removes nothing from the blood whose excess is conspicuous by color or by our present chemical tests, as is the case with the bile, and partly because we are yet only approaching the removal of the pancreatic juice from the duodenum, while the examination of the fecal mass, twenty-five feet and twenty-four hours removed from the pancreas, is confused by the effects of intestinal digestion and bacterial change, so that we can detect nothing less than almost complete lack of pancreatic function.

There is no interference with deglutition, so that we may exclude the œsophagus. The bowels move regularly, there is no

marked excess of intestinal gas, no obvious discharge of mucus, and the transverse colon is located in its normal position below the stomach by percussion, including auscultatory percussion. There is no pouching out of the lower part of the abdomen to warrant the diagnosis of enteroptosis; there are no tender points anywhere in the abdomen, except in the epigastrium, which is normally tender. The appendix is not palpable. In short, the only indications of intestinal disturbance are the excess of urinary indican suggesting bacterial putrefaction—a tautology purposely employed —and some distention of the left part of the colon which I shall consider along with the stomach.

On inspecting the lower part of the thorax, we see a curve of spots, each of which is a minute venous varicosity, of arborescent form, the trunk emerging from the deeper tissues. This sign I described some years ago as almost pathognomonic of portal obstruction, blood which should pass easily through the liver into the hepatic vein and thence into the vena cava inferior being forced to enlarge a normally invisible channel into the penetrating terminals of the inferior mammary, by way of certain diaphragmatic anastomoses with the portal branches. Extreme consequences of portal obstruction, in the shape of abdominal veins like whip-cords and a caput Medusæ at the umbilicus, are classic, but the principal value of the physician is his ability to recognize disease before it reaches an extreme and typical stage. In moderate degrees of portal obstruction, and especially in those that occur in the liver and not in the portal trunk, transudations are also lacking, as we have already demonstrated in this case. It is commonly taught that hemorrhoids are a consequence of portal obstruction. This is true of the extreme degrees; but in this patient, as in others whom he exemplifies, we elicit no more history of hemorrhoids than any average human adult will give. This patient has a few times during his life had piles following constipation or the passage of a hard fecal mass, just as you and I may have had. No enlargement of the spleen is found by palpation or by auscultatory percussion, care being taken in the use of the latter method to avoid mapping out the posterior projection of the stomach. Theoretically, we should expect the spleen to enlarge in portal obstruction; practically, its smooth muscular tissue is usually able to compensate, and, at any rate, the size of the spleen is not a fixed quantity.

Portal obstruction may be due to tumor, extraneous pressure, or thrombosis outside of the liver, but is much more commonly due to hepatic sclerosis. Moreover, the exohepatic cases are particularly apt to be accompanied by ascites. Even macroscopically it is fairly easy to diagnose hepatic sclerosis by direct inspection of the liver, but clinically we must base our decision on the signs of back pressure and the size of the liver. I would like to include the toxæmia, but personally I am not able to distinguish this toxæmia from others. Now, a liver may be of normal size and still be the seat of interstitial change, and in such cases our diagnosis is largely tentative. In this case, by auscultatory percussion, the liver extends in the mammillary line from the fifth to the seventh space. It ought to reach from the fourth rib to the lower border of the costal arch. The upper border of the liver, by auscultatory percussion, is at the same level as determined by ordinary heavy percussion. The dome, too far from the surface to be detected by any physical means except perhaps the Röntgen rays, should reach a rib higher. Ordinary percussion of the lower border usually elicits intestinal tympany. We can verify the lower border by palpation, although in just such cases as this I have been contradicted by good physicians who insisted that they felt the margin of the liver just at the costal arch. The explanation is that they failed to allow for the thickness of the abdominal wall, which they had pushed up till it met the liver. The actual breadth of hepatic *flatness* is not of much importance, while the total height of liver, near enough to the body wall to be detected, affords an excellent idea of the amount of liver tissue, though we should allow for its breadth in broad-chested individuals.

Turning our attention to the stomach, we find, by auscultatory percussion six hours after eating, that it reaches its normal height in the sixth intercostal space in the mammillary line. While I can mark out its upper curve without trouble, I detect the shock of percussion until I reach a curve only an inch or two above Poupart's ligament. On the face of the matter this suggests an enormous dilatation, but there is no lump in the pyloric region, and such a degree of dilatation without organic obstruction at the pylorus or immediately beyond is almost unheard of. Nor is there the history of stagnation of gastric contents, of excessive fermentation, and of general failure of health to correspond. This area may represent

the juxtaposed stomach and dilated or rather distended left colon. Usually the distinction is quite easy either by auscultatory or ordinary percussion, the stomach being enough larger than the colon to give a resonant note at least a semitone lower. Here I cannot distinguish a demarcation by either method. We can settle the question by having the patient drink some water, when, if this area belongs to both stomach and colon, we shall have a zone of flatness in the middle. But here is a little instrument that I devised several years ago to supplement auscultatory percussion. It is simply a tuning-fork set in a hard-rubber base. While the coarse, unassorted, and complex vibrations of the plexor finger may be carried across a delicate partition between two organs of approximately the same consistency, the monotonic vibrations of the tuning-fork will not be so carried. With this instrument it is easy to separate this large area into two, the stomach reaching only to the umbilical equator. This is an inch lower than normal, but it represents a mild degree of atonic dilatation quite in keeping with the conditions present. We can now verify this result by percussion with the lower part of the stomach dulled by water.

The chemical examination of the stomach contents extracted one and one-third hours after a breakfast of two slices of bread and butter—approximately fifty and five grammes, respectively—and two hundred and fifty cubic centimetres of water, results as follows: total quantity, sixty cubic centimetres; total acidity by phenolphthalein, 40 degrees; free hydrochloric acid by dimethyl-amido-azo-benzol, zero; rennin present; of carbohydrates, starch absent, erythrodextrin and sugar present; of proteids, the bulk of moist precipitate after thorough centrifugalization is as follows: albumin by heat, one per cent.; albumose by ammonium sulphate, three per cent.; peptone by phosphomolybdic acid, thirty-three per cent.[1] These results are practically normal except the absence of hydrochloric acid and the consequent low total acidity. But, though digestion has progressed normally in the filtrate, it is absolutely deficient, as shown by the low fluidity of the chyme, unless we suppose that there has been an exceedingly active absorption from the stomach, and this is contrary to the modern view that the stomach scarcely absorbs at all. Normal gastric contents ought to yield

[1] See prize essay by the writer, J. Am. M. Ass., 1900.

more than fifty per cent. by volume of clear filtrate, but of these sixty cubic centimetres ten were used unfiltered for the successive titration of hydrochloric acid and total acidity, and from the remaining fifty only about eleven were obtained, of which ten were used for the proteolytic tests and one for the qualitative tests; there was none left for the estimation of combined acidity. Normal gastric contents, on the other hand, are quite fluid and there is plenty of filtrate for various experiments. You may be surprised that I place the total of stomach contents so high as sixty cubic centimetres, for the older authorities allowed only twenty or thirty cubic centimetres. This has been explained as due to differences between German and American stomachs, the earlier figures being based on observations on German students. It seems to me that a more satisfactory explanation is the use of larger tubes and greater patience in extracting the chyme.

From the failure of hydrochloric acid and the *a priori* knowledge of the obstruction to the portal circulation, we are justified in making the diagnosis of gastric catarrh; but I would call attention to the fact that we cannot estimate the degree of interstitial change nor can we draw sharp lines between catarrh and secretory failure of purely functional nature. Examination of shreds of mucosa, or rather of groups of epithelial cells, accidentally present, does not help us, as has been asserted, because there is normally a shedding from the stomach, as from the tongue and skin, of degenerated epithelium. The diagnosis of catarrh used to be made from the mucus found, but most of the mucus comes from the throat and nose or the œsophagus. In particular, this stringy mass of mucus is always present and represents the normal lubricant of the œsophagus. The diagnosis of gastric catarrh by the presence of mucus reminds me of a post-mortem examiner who used to diagnose fatty degeneration of the heart whenever he could find a "chicken-fat" clot in the ventricle. Of course, if we can keep washing mucus from the stomach after emptying it and throwing out the first few stomachfuls, which contain the œsophageal mucus and that swallowed from the throat and nose, we are justified in diagnosing mucous catarrh, but chronic gastritis is by no means merely a matter of mucus formation. [Note.—The lavage of the jejune stomach in this case did not reveal an excess of mucus.]

Aside from the slightly movable right kidney, which is a negli-

gible factor, this case presents the ordinary atrophic form of hepatic sclerosis, a chronic gastric catarrh with secretory depression, not noticeably affecting the ferments, and with atonic dilatation. The colonic dilatation is undoubtedly due to fermentation, with production of gas, and muscular relaxation, just as in the stomach. You will naturally ask the sequence of these changes. As to the time relations of the catarrh, the secretory depression, and the muscular yielding of the stomach, I am unable to express an opinion, as any one of them would predispose to the others, in a vicious circle. The atonicity proper is not of high degree, as other examinations show that the stomach is emptied of a simple meal within six hours. The colonic trouble is undoubtedly due to the trouble higher up. An apparently logical conclusion is that the gastric changes depend on the portal obstruction within the sclerotic liver. But then how shall we explain the liver disease? Most text-books assign hepatic sclerosis to the irritation of alcohol absorbed from the stomach, or else to a dyscrasia whose toxic constituents irritate the liver. Very few of my patients are alcoholics, and I doubt whether it is correct to assign hepatic sclerosis to a moderate indulgence in beer with an occasional drink of other liquor. Numerically, I see many more total abstainers than alcoholics with hepatic sclerosis. Most text-book writers base their statistics on ward patients, and they certainly will find that most of their sclerotic cases have been drunkards. Even so, I doubt whether the alcohol is the direct cause of the sclerosis. We must remember that drunkards are subjected to vicissitudes of weather, that they eat irregularly of improper food, which is very apt to ferment in the stomach, and that sometimes the portal blood is surcharged with nutriment and sometimes the liver is starved for considerable periods. In many of my total abstainers with hepatic sclerosis there can be elicited a history of life-long dyspepsia, and it is perfectly possible that the organic acids and other results of gastric fermentation are the cause of the hepatic sclerosis. In this case we obtain no such history. Neither is there the history of malaria, which is the commonly recognized dyscrasic cause of hepatic sclerosis. I do not allude to the infectious granulomata in this connection, for the kind of hepatic sclerosis which they produce is essentially the local manifestation of a specific disease and not analogous to a general sclerosis due to irritation or other assumed cause. Nor do I care to go into the

differences between hypertrophic and atrophic sclerosis, nor to discuss the theories as to whether ordinary hepatic sclerosis of the contracted form is essentially an interstitial inflammation, with strangulation of epithelium by connective tissue, or whether the epithelial cells first degenerate and are secondarily supplanted by connective tissue. Either theory can be adapted to the etiology by a slight change of conception.

The same conditions that have produced the hepatic disturbance must tend to similar change in the kidneys and, both chemically and mechanically, to chronic inflammations or, if you prefer the term, degenerations of the myocardium and endocardium. This involvement of liver, kidneys, and heart used to be called triple lesion; but, as I pointed out several years ago, a triple lesion is really a multiple visceral lesion, for, when demonstrable changes have occurred in these organs, the circulatory and toxæmic factors have produced static and degenerative changes in the lungs, stomach, and spleen, if not in the intestine and pancreas, while the serous cavities will also have participated in various forms of dropsy. As a matter of practical prognosis, however, this degree of relatively uncomplicated hepatic sclerosis does not tend materially to shorten life if the patient will observe proper precautions. In other words, the liver still has enough functionally active cells if we are moderately careful not to overtax them and if we tide them over periods of threatened failure of compensation. Six years ago there came to me a patient who had been by two or three physicians condemned to death by gastric cancer. His cancer was only the dilatation, secretory failure, and fermentation of a stomach like this patient's, but of worse degree. His liver was in almost exactly the same state and degree of contraction as the present patient's, and it has not appreciably contracted since. Except for a few brief periods of treatment the patient has remained well, and to-day he is subjectively and to all appearances a well man. This is simply a rather striking instance, while numerous others might be mentioned. But if these patients insist on permanent cure and neglect themselves when they find that they cannot remain well without occasional medical aid, or if they insist on overtaxing their livers and kidneys with an excessive amount of nitrogenous food in the form of extractives, they will inevitably drift into a condition of chronic dyspeptic invalidism of the worst type, the kidneys or

heart or both will succumb, and they will die of uræmia, circulatory failure, or the toxæmia and asthenia of gastric catarrh and dilatation, which last will probably be assigned in the death certificate to cancer, if no necropsy is held.

As to treatment, there is the direct indication to aid the stomach by giving hydrochloric acid and supporting it with strychnine. There is obviously an abundance of peptic action, yet many such cases are treated with pepsin. I shall wash out the stomach a few times and spray it with a two per cent. solution of menthol in pure petrolatum, to influence the catarrh, or introduce hydrogen peroxide if there is much mucus or foulness. The spraying also acts as a massage of the stomach. [NOTE.—There was little mucus present, and lavage and spraying were carried out only twice, on account of the distance which the patient had to come and his rapid improvement.]

Now, if the liver were essentially a digestive organ, forming a secretion of great value, it would be rational to administer bile. As a matter of fact, the liver is mainly emunctory and bile is of very little value in digestion. Thus the administration of bile is on almost exactly the same footing as the administration of urine in renal disease. But just as we may give urea to stimulate the elimination of positively harmful ingredients of urine, so we may administer the glycocholate and taurocholate of sodium as cholagogues. These in a chemically pure state are very expensive, and I believe are no better cholagogues than the salicylates, which are also fairly efficient intestinal antiseptics and therefore doubly indicated in some of these cases. If there were constipation and intestinal toxæmia, calomel would be indicated, and, though not experimentally a cholagogue, it is probably practically so by getting rid of biliary salts that would otherwise be reabsorbed and re-excreted, thus forcing the liver to start fresh. In a case like this it is not especially indicated, and its administration would be the sacrifice of a trump because we can use it only occasionally.

The very best cholagogue is the same as the best diuretic and diaphoretic,—water. To get its best action on the liver, it should be given hot on an empty stomach. Not more than fifty or one hundred cubic centimetres should be given at once, but this dose should be repeated every half-hour or so, till one thousand or fifteen hundred cubic centimetres have been introduced. I find that most

of my patients prefer to devote Sunday afternoon to this water treatment. It is obvious that, whether absorbed from the stomach or the small intestine, it passes directly to the liver and washes out a good deal of toxic matter, not to mention the glandular stimulation by the hot application against the liver. The patient experiences a free diuresis, sometimes also a catharsis or diaphoresis, and the indications of hepatic poisoning rapidly abate. It is not usually necessary to repeat this method of treatment oftener than every week, and usually, after a month or two, or longer if the stomach itself is markedly affected, the patient feels quite well and may be discharged with the caution to return on the first appearance of unfavorable symptoms, which will usually be in from six to nine months.

I have alluded sufficiently to the general indications as to diet. So long as the patient does not take too much nitrogenous waste and the substances from which such waste is derived, including tea, coffee, chocolate, and cheese, he should be allowed a liberal but not excessive dietary. Do not make the mistake of starving these patients so far as iron is concerned by putting them on a milk diet, nor the equally glaring one of attempting to combat a supposed anæmia by medicating with iron. The best kind of iron is found in food, not in inorganic chemicals on the one hand nor in proprietary substitutes for hæmoglobin on the other. Think a minute before giving nuclein and you will not give it at all. Remember that for a sick liver, as for a sick kidney, you must medicate around and not at the diseased part.

PANCREATIC CYSTS.[1]

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The two cases of pancreatic cysts here recorded illustrate the difficulty of correct diagnosis, owing to absence or diversity of symptoms, combined with the different positions assumed by the cysts. The many diverse theories as to the etiology and pathology of this condition are of great interest, and a summary of these will not be out of place in this paper.

By analogy, the pancreas, like other secreting glands with ducts, might under certain circumstances become the seat of cysts of different varieties,—viz., cysts from retention, adenomata, new formations, parasites, and degenerative changes. For the development of retention cysts it is necessary that the walls of the secreting cavity should admit of enlargement so that tension should not become sufficiently great to check secretion. With this condition the pancreas complies in a marked degree. Moreover, cysts occur in the pancreas which one might take to be retention cysts, on account of their clear fluid contents, absence of blood, and presence of one or more of the properties of pancreatic juice, especially the proteolytic. But the experiments of Senn and others have demonstrated that complete experimental obliteration of the main duct of Wirsung does not lead to cyst formation in the pancreas, but to a more or less uniform dilatation of the ducts, primary and secondary, throughout the whole organ, with sclerosis of the gland by increased development of interstitial fibrous tissue,—thus leading one to infer that some other explanation of these cyst formations is necessary.

Certain peculiarities of the pancreas distinguish it from most

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[1] I have to express my indebtedness to Mr. T. H. Morgan and Mr. Stanley Boyd, of Charing Cross Hospital, for permission to publish these cases.

other racemose glands. Its structure is very loose, there is little interstitial tissue, and the alveoli are long and delicate; hence the gland is vulnerable and easily bruised, and a slight trauma might easily result in its laceration or other injury. Being exceedingly vascular, with the vessels under high blood-pressure, it is liable to considerable danger from hemorrhage and to the escape of its secretion into its interstitial tissue or into surrounding parts. Its frailness and vascularity are, therefore, important factors from the etiological and the pathological stand-point. Its anatomical relations to the lesser sac and other pouches of peritoneum and its retroperitoneal position help to explain the diversity in size, shape, and behavior of the cysts when they enlarge.

The greater certainty of diagnosis of chronic pancreatitis, born of clinical and operative experience, shows this condition to be far more common than was at one time appreciated, and its influence in the formation of these cysts cannot yet be gauged; but from analogy with other secreting glands, such as the kidney and breast, it is probable that sclerosis may lead to minute cystic formation by obliteration of the smaller ducts. It is more than probable that it is from such occluded lateral branches that most of these cystic conditions, at least primarily, arise.

Etiology.—The causes of pancreatic cysts that have been suggested are numerous. 1. Some congenital defects resulting in cyst formation usually associated with similar cystic conditions in the kidney and liver. 2. Trauma. 3. Chronic pancreatitis from any cause, especially partial obstruction to Wirsung's duct: (*a*) gastroduodenal catarrh; (*b*) gall-stones in the bile duct or ampullæ of Vater; (*c*) ulceration of stomach or duodenum; (*d*) pancreatic calculi; (*e*) pressure of tumors or adhesions upon the duct; (*f*) chronic portal obstruction; (*g*) zymotic diseases, especially typhoid fever and influenza; (*h*) extension of inflammation to the pancreas from neighboring parts; (*i*) the invasion of the duct by *Ascaris lumbricoides*. 4. Cysto-adenomata analogous to those of the ovary. 5. Vascular causes not due to trauma and those associated with hemorrhagic dyscrasiæ: (*a*) interstitial or peripancreatic hemorrhage; (*b*) dilatation of pancreatic blood-vessels. 6. Pseudocysts,—by the encroachment of fluid collections in the neighboring pouches of peritoneum, opening up the lumen of some of the smaller ducts of the pancreas by pressure atrophy and so allowing escape into the

"cyst" of pancreatic secretion. 7. *Tænia echinococcus.* 8. Fat necrosis about the pancreas.

Incidence of the Disease.—In the aggregate, adults of both sexes suffer equally; but trauma is the more common exciting cause in men, and inflammatory causes predominate in women.

Pathology.—*Trauma.*—Slight blows, constant or repeated pressure on the upper abdominal region, and even deep massage produce the pathological changes whereby cysts occur. The effect of such trauma is: (*a*) Hemorrhage (interstitial or peripancreatic). Interstitial hemorrhage is almost certainly associated with injury to some of the alveoli and may be accompanied by laceration of the smaller ducts. (*b*) Production of subacute pancreatitis or peritonitis.

The extravasation of blood is not sufficient, in itself, to give rise to symptoms of pancreatic hemorrhage, but the symptoms which supervene will nevertheless depend upon its amount and upon the accompanying unavoidable inflammation. Some escape of pancreatic juice almost invariably takes place, usually in an admixture of blood and secretion; and the irritation set up by this foreign substance tends to produce a fibrous capsule, the cyst developed communicating with a secreting surface. The increase in size of the cyst occurs by continued accumulation of pancreatic juice and more especially by further hemorrhage from the cyst wall. At the time of the primary hemorrhage the bleeding may involve the lesser sac or other pouch of peritoneum, and if the escape of pancreatic juice is considerable, or small hemorrhages recur, a rapid tumor formation occurs from the accumulation of this fluid and the peritonitis set up.

Hemorrhage from other causes than trauma produces cysts in a similar manner, but small hemorrhages may occur without cyst formation, as has been demonstrated *post mortem,* the blood having undergone partial absorption or left traces of its former existence by yellowish-red areas containing hæmatoidin crystals. The ruptured vessels from which the hemorrhage originated are not usually found, and therefore it seems probable that dilatation of pancreatic blood-vessels as a cause of cysts is not at all frequent.

If subacute peritonitis be set up, an encysted fluid collects which either immediately or subsequently by atrophy or hemorrhage communicates with the lumen of lacerated pancreatic ducts. Subacute

pancreatitis acts by producing pressure on the ducts, with retention cyst formation.

Retention Cyst Formation.—This is the probable explanation of a great number of cysts. They may result from catarrh of the ducts, as enumerated under causes of chronic pancreatitis, or from localized or general chronic interstitial pancreatitis from any other cause, such as traumatism, alcoholism, etc. Whether obstruction to the main duct ever causes, *per se,* cystic dilatation in its continuity is doubtful. Senn's experiment seems to disprove its possibility, but in some cases the main duct has been found obliterated or traced from its duodenal or splenic extremity into or through a cyst, which seems to indicate the possibility of its being so dilated as to form a cyst. But, on the other hand, such cyst may have been a true retention cyst of a small lateral branch, involving secondarily, by pressure-atrophy, the lumen of the main duct. The more likely explanation is that, whatever its cause, obstruction to the flow of the pancreatic juice sets up a sclerotic condition of the gland by increase of the interstitial fibrous tissue; this in its contraction cuts off or obstructs very gradually the lesser ducts of the pancreas, which, by continued accumulation of secretion from the parenchyma, dilate and form cysts. In the majority of cases hemorrhage into these cysts occurs at some time, and produces thereby more rapid growth or, eventually, rupture into the surrounding pouches or subperitoneally.

Adenomata of the pancreas exist, as might be expected, and take the form of cysto-adenomata; from their walls depend ingrowths of delicate fibrous tissue, covered by cubical or cylindrical epithelium. The cysts may be multiple or single, and vary in size from that of a pea to a hen's egg. Usually they communicate with one another by apertures of varying size. Intracystic hemorrhage and rupture, with extravasation of their contents into the surrounding parts or into the hollow viscera, may occur in this as in any other form of pancreatic cyst.

Pseudocysts, due to serous peritonitis or hemorrhage into the lesser sac of peritoneum or one or other of the paraduodenal pouches, may secondarily involve the pancreatic tissue. This may occur, it is assumed, by pressure-atrophy of the parenchyma laying open the alveoli or ducts, which then communicate with the pseudocyst. Echinococci cysts are rare.

The cyst wall may consist of (*a*) Distended and atrophied pancreatic tissue. (*b*) Fibrous tissue derived by distention from the pre-existing fibrous tissue of the neighborhood, but more probably originating in inflammation set up by the irritation of the cyst. (*c*) It may be adenomatous,—that is, fibrous tissue with a lining of cubical or columnar epithelium. (*d*) Or it may consist of peritoneum and the walls of the adjacent viscera. Internally the cysts may, therefore, feel smooth, rough and trabeculated, or papillary.

Site, Shape, and Topography.—Cysts may originate in any part of the pancreas, but more commonly the tail is affected. They may rarely project from the gland, as if pedunculated. They are usually semicircular or roughly spherical and are present as smooth swellings having a tense feel. They grow forward, usually having the stomach above and the transverse colon below and in front; but, as they may extend or rupture into the mesentery, mesocolon, lesser sac of peritoneum, or the retroperitoneum, they may be found above the lesser curve, below both colon and stomach, or about the left kidney and spleen. These swellings appear most frequently in the epigastrium, especially between the left costal margin and the midline, as well as in the midline or to its right side, and extend into the left and right hypochondriac and lumbar regions. In a considerable number of cases their chief projection may be below the umbilicus. A great variety in physical signs results. They are immobile, and the respiratory action is *nil.*

The Contents of the Cysts.—These range from a colorless, limpid fluid to a dark-brown, grumous material. The majority contain altered blood and are therefore of a reddish color. Some, however, contain a grayish, opaque, slightly viscid fluid, invariably alkaline, sp. gr. 1010 to 1024. The chemical properties also vary. Some contain proteolytic, amylolytic, and fat-splitting ferments in greater or less activity. Amylolytic and fat-splitting properties are not pathognomonic, as a few other fluids have similar properties. The power of proteolytic action is diagnostic, but undoubted pancreatic cysts may be deficient in proteolytic action.

Signs and Symptoms in General.—There is no pathognomonic sign of pancreatic cyst. There may be premonitory symptoms before the appearance of a swelling,—viz., those of gastric disturbance, flatulence, loss of appetite, pyrosis, vomiting, diarrhœa or constipation, with sense of fulness and tenderness in the epigastrium. There

may be emaciation, intestinal hemorrhage, and slight associated jaundice. Very rarely there are signs of deficient pancreatic secretion,—*i.e.,* fatty, light-colored stools, undigested muscle-fibre (in the absence of diarrhœa), glucosuria, lipuria, or polyuria; and the salol test is usually negative. There may be preceding symptoms due to a pancreatic calculus.

Often there is a definite onset, or signs and symptoms appear for the first time when the cyst has attained a considerable size. Such onset is with abdominal pain, usually in the upper part, with vomiting and some amount of collapse.

Case I.—J. H., married woman, twenty-seven years of age. Admitted on January 18, 1899, for ovarian tumor.

Family History.—Good.

Personal History.—Married three years. She has never had any severe illness of any kind except her confinements. Since the birth of her first child, two years ago, the patient has ceased to menstruate. Six months before admission she was delivered of her second child; there was no difficulty at labor and at this time she was apparently well. Her abdomen has always been rather full.

Present Illness.—For three months subsequent to her last confinement, six months ago, she remained in good health, but did not menstruate. One day, three months ago, while at breakfast, she had severe pain in the abdomen, and vomited before she could undress to get into bed. She says that she was collapsed and vomited repeatedly, and then noticed that her abdomen seemed swollen. The pain subsided gradually and with it the swelling of the abdomen. She was in bed fourteen days. The bowels were irregular, but there were no urinary symptoms. Similar attacks of pain and vomiting occurred every week or fortnight, but less severely, up to ten days before admission. Each attack was accompanied by general swelling of the abdomen. One month ago the patient noticed a swelling in her left side just below the costal margin; this has since persisted, and has grown painlessly to its present dimensions,—*i.e.,* pain was not attributed to or felt in the tumor itself. The patient cannot say whether the swelling has grown from above downward or from side to side.

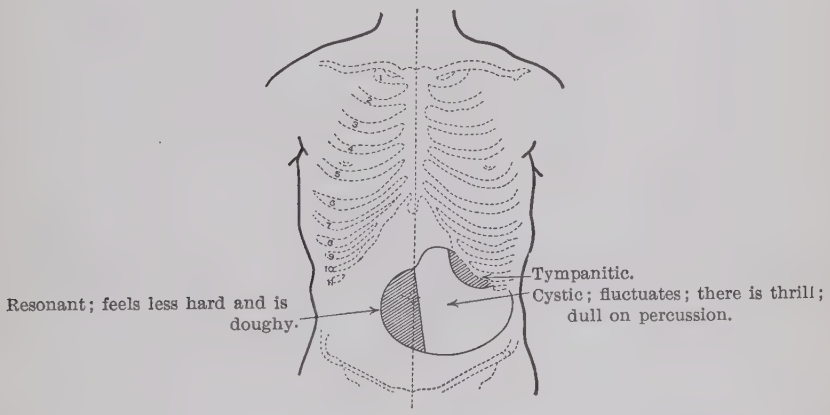
Three weeks ago, for two or three days in succession, she passed "port-wine" colored urine, painlessly and without other symptoms.

She was going about her housework at the time. A week later she suffered from retention of urine, failing to pass water for forty-eight hours. Since this time she has passed her urine regularly every forty-eight hours involuntarily, but only a small quantity each time. She had not passed large quantities of urine with disappearance of the tumor.

Condition on Admission.—The pulse was 72 and normal; respiration, 18; temperature, 99.8° F.; this fell to 98.4° F., then remained normal till the operation. She passed no urine for thirty-six hours, so was catheterized and thirty-six ounces were drawn off; it was dark, amber-colored, sp. gr. 1028, no albumin or sugar.

Examination.—The patient looks pale, thin, and worried, and is anæmic. The *abdominal lineæ albicantes* are visible. There

FIG. 1.



is an irregular swelling in epigastric (slight), left lumbar, and umbilical regions; it is projecting and conical in shape, the visible apex being on a level with the umbilicus, and just to the left of it; it fills the iliocostal space, extending from the costal margin to the level of the anterior superior spine, and making the loin convex outward. The respiratory movements of the abdomen are well marked and the tumor moves visibly on deep respiration. It pulsates synchronously with the aorta. No enlargement of veins is seen. (See Fig. 1, drawn January 19, 1899.)

On *palpation,* the tumor is found to be of varying consistence, and its right extremity extends three inches to the right of the

midline. This portion feels more soft and doughy than the central and left parts, and pulsates, the pulsation not being expansile. The major part of the swelling occupying the umbilical and left lumbar regions is very firm, tense, and elastic in its central area, and here gives a distinct sense of fluctuation and a fluid thrill.

The tumor can be pushed with difficulty from side to side, but moves over towards the right to a marked extent when the patient lies on her right side and leaves the left loin free and hollow. It moves slightly with respiration, and can be grasped bimanually with hands behind and in front, and moved between them; it feels very heavy. Although the tumor appears to fill the left loin, the fingers can be insinuated into the loin without displacing the tumor, giving the impression of some soft, yielding structure being compressed between the fingers and the tumor. The left kidney cannot be felt. Tenderness is felt over the upper and right part of the tumor. The hand can be pressed below the tumor into the pelvis.

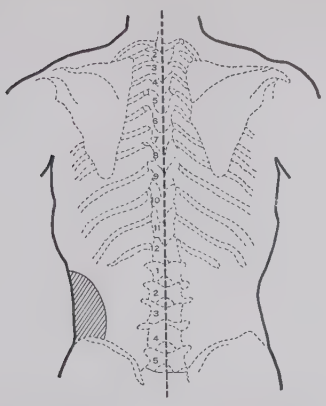
On *percussion,* the tumor is found to be tympanitic above, and is resonant on the right and dull over the central portion and that occupying the left loin. Posteriorly, the dulness merges into that of the spleen, while a continuous colic band of resonance cannot be made out. (See Figs. 2, 3, and 4, drawn on January 23, 1899.)

When the patient lies on her right side, the left loin is free and the part which was dull on percussion becomes resonant. The os uteri is directed markedly backward, with the cervix patent. The uterus is antiverted and lying to the right of the pelvis. The patient is not pregnant. The tumor cannot be felt, and the diagnosis is probably hydronephrosis.

During the ten days preceding operation the urine was drawn off daily by catheter, there being no desire nor capacity for micturition more often than once every forty-eight hours, but the urgency to empty the bladder at the end of this time seemed great. The quantity of urine gradually decreased so that, with one exception, only from twelve to sixteen ounces were obtained daily. On examination no casts, albumin, sugar, nor blood were ever found, its color was a medium amber, clear, sp. gr. about 1024 to 1028. The amount of urea averaged ten grammes, which is about one-half to one-third the normal amount passed *per diem.*

Tenderness in the epigastrium and on the tumor above and to the right of the umbilicus increased. The abdomen and tumor

FIG. 2.



Area of resonance previously dull when the patient lay on the right side.

FIG. 3.

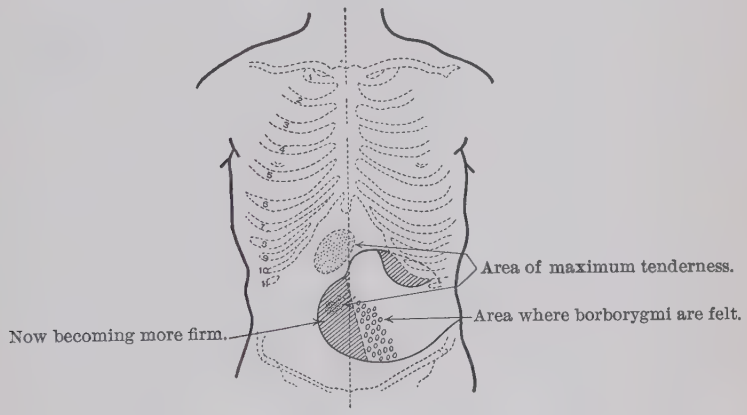
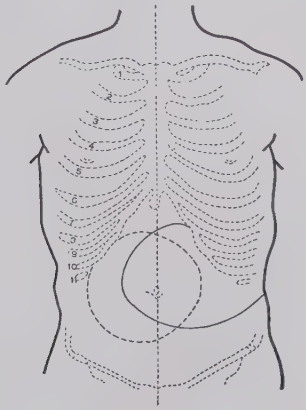


FIG. 4.



Dotted line shows position assumed by tumor when the patient lay on the right side.

became larger, a binder she wore having to be let out. The tumor appeared to be increasing in size painlessly towards the right side and it was believed to vary in size. She was somewhat constipated and needed purgatives, but the stools appeared normal. Borborygmi were felt passing over the right half of the tumor in a vertical direction on several occasions. No vomiting occurred.

Diagnosis.—A consultation was held and a diagnosis of hydronephrosis arrived at. The desirability of operating was discussed, in view of the small quantity of urea, which was always found to be about ten grammes.

Operation.—January 31, 1899. A four-inch vertical incision was made in the left semilunar line, with its centre opposite the umbilicus. The kidneys and pelvic organs were normal. The stomach lay above and to the right of the transverse colon, below and in front in a horizontal position. The descending colon with the left kidney appeared to lie behind the tumor. The anterior aspect of the swelling was covered by and adherent to the great omentum, which was here thinned out. Through this the cyst was tapped with a trocar, with proper precautions, and forty-four ounces of dark, dirty-brown material, viscid and odorless, were withdrawn. The interior of the cyst was velvety and corrugated. Its walls were so intimately adherent to the hollow viscera and seemed formed chiefly by it, that drainage was the only method of treatment open. The cyst wall was then stitched to the parietes with silk, including the whole thickness of the abdominal wall except the skin, the cyst wall being caught up about one inch from the puncture. The edge of the trocar puncture was sewn to the skin. The abdominal wound above and below the cyst opening was closed. A Keith's tube was introduced, and a considerable quantity of fluid was lost.

Character of the Fluid.—This was found to be turbid, viscid, and dark red-brown, with a specific gravity of 1010; microscopically it contained numerous red and white corpuscles and hæmatoidin crystals, and on boiling was almost solid with albumin. Amylolytic, proteolytic, and fat-splitting ferments were present. The amylolytic being most powerful, the other two were slightly less potent. On the second day the general condition was good; she was still on nutrient, with sips of water. She had been unable to pass her urine, so was catheterized, twenty-five ounces. Urea, twenty-five grammes.

February 1. *After the operation* the temperature rose to 100° F., but soon fell to normal and remained so during the remainder of the patient's stay in the hospital. She was slightly sick. The dressing became saturated and was changed, but the fluid was found to be chiefly blood oozing from the wound and the cyst margin and not flowing from the tube. To-day three or four ounces of blood-stained fluid were sucked up the tube. The patient is on nutrient enemata of milk and beef tea, peptonized, and given alternately. The amount of urine catheterized was twenty-five ounces.

On the third day the wound was redressed; the discharge from tube was two ounces, and the glass tube was replaced by rubber.

On the fourth day one drachm of foul fluid was drawn up the tube. The wound was slightly red about the sinus. She took milk by the mouth.

On the sixth day a few sloughs—probably cyst-lining—came away on the dressing. Only one and one-half drachms of turbid fluid came from the tube. The urine, twenty-six ounces, was slightly darker in color, and was secured by the catheter. As she was still constipated, an enema was given with good results.

Eighth day. Urine, twenty-six ounces, sp. gr., 1012; urea, twenty-five grammes. The tube was shortened one-half inch. The wound was healthy, and there was very little discharge, which was clearer.

Ninth day. The urine was passed voluntarily for the first time and measured fifty-eight ounces. Some more small sloughs were removed, and there was no discharge through the tube. From this date till the fifteenth day the urine was normal, the quantity varying from thirty-five to forty-five ounces. The stitches were removed; the discharge was little and clearer. The tube was shortened one-half inch. Diet, solids; the bowels were obstinate. The skin about the sinus began to be red and irritated and a little purulent discharge on the sinus wall occurred. The tube was removed on the fourteenth day.

The sixteenth day a serous discharge, probably four ounces, occurred through the sinus, soaking the dressing. The cyst cavity has contracted to a mere tract. The tube was reinserted. The skin was very irritated and tender.

From the sixteenth to the twenty-fourth day the wound discharged two to three ounces daily; it was redressed twice daily for

the purpose chiefly of removing the saturated dressing and preventing skin irritation, which was of the character usually seen about gastric fistulæ. Antiseptic ointment was smeared over the skin. On the twenty-fourth day, the patient had pain in the abdomen and vomited, probably from the purgative. The urine was normal and was passed three or four times daily. The urea averaged twenty-five grammes. Some of the discharge collected possessed amylolytic and proteolytic properties. Soon after the tube was permanently removed from the sinus.

Up to April 5, two months after the operation, the sinus discharged more or less, usually one or two drachms a day, and it closed several times only to break open again. The patient is a little stouter. The sinus is five inches long, barely admits a probe, and has been treated by application of silver nitrate on several occasions. The patient has been sent to a convalescent home.

May 5. The patient was seen in ward. The sinus closed permanently in the middle of April, two and one-half months from date of operation. The patient is putting on a little weight; there are no digestive derangements.

On January 18, 1902, nearly three years later, the patient was quite well, had had no trouble with the wound, and the sinus had not once reopened. She has been delivered of a child in the interim.

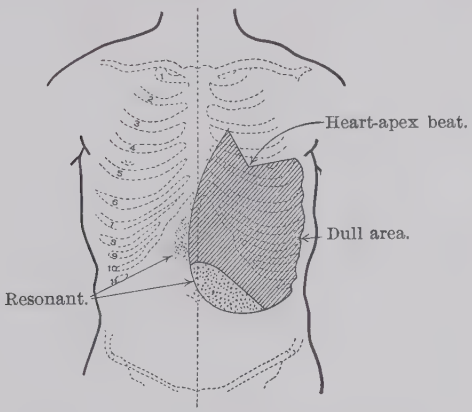
Case II.—Miss V. D., theatre attendant, aged twenty, single, admitted, September 20, 1899; discharged, October 26, 1899, with pancreatic fistulæ. On admission, the temperature was 98.6° F., pulse 76; the urine contained a trace of albumin. The patient appears to be in good health and is well nourished.

Personal History.—With exception of colds, neuralgia, and slight indigestion, there was no serious illness until ten months ago, when she had two attacks of left-sided pleurisy, an interval of a fortnight elapsing between the attacks. About two months previous to that there is a history that she was struck in the chest by a door swinging to, of which event she took no notice.

Present Illness.—Six months before admission she noticed fulness of the abdomen and the presence of a swelling. This was situated in the upper part of the abdomen; it has not grown rapidly, but her corsets have had to be loosened from time to time. It has been occasionally painful. The night before her admission she

took cold and experienced pain in the left side. No evidence of pleurisy could be discovered the day after admission. (Fig. 5.)

Fig. 5.



Examination.—The left lower ribs are bulged out markedly. A smooth, oval swelling is seen in the left epigastric and hypochondriac regions, probably the size of a medium water-melon. The skin is normal and the veins are not enlarged.

On *palpation* a smooth, regular, elastic, and apparently tense cystic swelling is felt. This moves slightly on respiration, but the amount is not great and is difficult to determine on account of the tenseness of the abdominal wall. Towards the right the swelling gradually disappeared, there being no definite edge. Below there is a distinct, palpable margin, extending to within one and one-half inch of the umbilicus. The edge of the liver cannot be felt. The swelling is not attached to the anterior abdominal wall, and fluctuation cannot definitely be made out.

On *percussion,* the tumor generally is found to be dull, and this is continuous above with a cardiac dulness and extends into the left axilla. At times, just above the lower margin, the high-pitched note can be made out passing below into intestinal resonance. The liver-dulness on the right is separated from the tumor resonance by a band of resonance two and one-half inches wide. It is impossible to ascertain the actual position of the liver, as it is not palpable. The stomach resonant could not be made out, as it was not inflated.

Operation.—September 27, 1899. A median incision, three

and one-half inches, was made midway between xiphisternum and umbilicus, the peritoneum opened, and the tumor covered by thinned omentum, at once presented. The liver was felt far back behind the ribs, normal in size, and lying above and to the right of the tumor. The transverse colon lay below. The stomach was not seen until late in the operation and the spleen was not yet palpable. An exploring syringe was passed into the cyst and a brownish fluid was extracted. It was then tapped with Lawson Tait's ovariotomy trocar, after packing round with gauze, and pressure was kept up on the abdominal parietes. A large quantity of fluid escaped. The trocar hole was then clamped and the stomach sought for; its pylorus was found projecting and below the liver. The spleen was felt far back; the left kidney was normal. The cyst sprang from the left end of the pancreas. The edges of the cyst wall were then sewn with catgut to the centre of the incision, the suture including all abdominal parietes except skin. Keith's tube was introduced, the wound above and below it was closed, and gauze was passed into the tubes after a small quantity of fluid was sucked up; seventy ounces of fluid were collected.

Character of the Fluid.—This was dark, reddish-brown, of thick consistency. It was faintly alkaline, sp. gr. 1016, showing considerable amount of albumin on boiling. There were large numbers of red and white corpuscles and *débris* in considerable amount. It possessed powerful amylolytic action; the proteolytic action was not tested for.

After the operation the pulse was 108, temperature, 99.8° F. She vomited once. A few drachms of fluid were drawn off from the tube in the next twelve hours. She had slight pain in the lower part of the chest.

September 28. A morphine injection was given at midnight. The wound was dressed, and the glass tube was replaced by a rubber one fixed in by two stitches, iodoform gauze being packed round the tube and a strand passed into it. She had slight pain in the chest.

September 29. She has been sick several times. The wound was redressed twice, the amount of discharge being small.

Fourth day. The wound was redressed twice yesterday and once to-day; there was only a slight discharge. As there was a pustular eruption on the skin about the wound, boracic ointment

was applied over the affected area, and salicylic wool was used instead of blue wool. The bowels acted to-day and appear normal.

Fifth day. The wound was redressed; the tube, three and one-half inches long, removed, cleansed, and easily replaced.

Seventh day. The stitches were removed and the wound was redressed; the discharge is now clear and serous and the dermatitis is not extending.

Seventeenth day. The patient has had normal temperature. The appetite is good, and she is quite well. She requires mild aperients, but the stools are normal. The tube has been replaced by one of smaller calibre, about the size of a small lead-pencil. It is three inches long, but a probe can be passed easily five inches. The skin is now healthy.

Twenty-fourth day. The serous discharge has increased in amount, and the wound needs redressing twice daily. The discharge has powerful amylolytic action. From this time till her discharge the secretion varied in amount, and the patient appeared quite well. She was discharged with a sinus, and has been lost sight of.

The first case shows several unusual symptoms which were misleading and pointed very strongly to left renal mischief; these are the small quantity of urine without concentration, the deficiency of urea, and the peculiar character of urination—although this is probably explained by the small quantity of urine secreted, the bladder being capable of retaining this accumulation for forty-eight hours without being excited to action. Yet she was unable voluntarily to empty her bladder at an intervening time, when there must have been some quantity of urine present. The position and free mobility of the tumor suggested kidney, while its mobility negatived pancreatic cyst. The definite onset of symptoms followed by the comparatively rapid tumor formation suggests a hemorrhage into or from the pancreas.

The second case illustrates the high position in the abdomen sometimes assumed by these cysts. It is probable that the case was of traumatic origin and dated from the blow on the chest, the first symptoms a short time later being attributed to pleurisy. Pancreatic pain often shoots round the left side into the left scapula.

THE PRESENCE AND THE SIGNIFICANCE OF BETA-OXYBUTYRIC ACID IN THE URINE OF DIABETICS AND ITS RELATION TO THE COMA.

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The mystery that still envelops the precise cause of that fatal coma which, unfortunately, only too frequently ends the life of the victim of diabetes has led to much investigation into the urine and the blood in this disease. Having had the opportunity during the past year of examining no fewer than twelve cases of, as a rule, grave diabetes,—an opportunity which I owe to the courtesy of professional brethren,—I have directed some attention to the presence of beta-oxybutyric acid in the urine. Now, this acid appears to be at the present time in the opinion of many, perhaps of most clinicians, the most likely cause of diabetic coma, and it is with a view to throwing some light on this point that I take up the matter.

The Abnormal Constituents of Diabetic Urine.—In diabetes, urea, phosphoric acid, and especially ammonia are increased. The presence of the last substance in excessive amount is significant and will be referred to again. Uric acid is usually present in greater amount than in health, but is not relatively increased as much as urea is. These are all normal elements. The abnormal elements are dextrose, acetone, aceto-acetic (or diacetic) acid, and beta-oxybutyric acid. Grape-sugar, of course, does occur in traces in urine in health, but when it is recognizable by ordinary clinical tests we may regard it as a foreign body. Its nature and reaction being well known, it may be dismissed at once. It is apparently often split off with great ease from the proteid molecule in the disturbed metabolism of the diabetic. Acetone has long been known to exist in the urine in these cases, but it is met with in numerous other

diseases as well,—*e.g.*, cancer, fevers, and digestive disturbances. In the maternity hospital of this city it has on several occasions been detected in the urine of pregnant women carrying a macerated fœtus. This is of interest, as there are other indications that its presence is associated with an increased destruction of albuminous tissues.

Acetone, which has the formula $CH_3.CO.CH_3$, is a colorless clear liquid, with a pleasant fruity odor, which may be communicated to the urine and may be detected even in the patient's breath. It boils at a comparatively low temperature (56.3° C.,—about 133.5° F.), and so can easily be separated from urine by distillation. It may readily be detected, and the following is the test most commonly employed when accuracy is required.

Lieben's Reaction for Acetone.—The test-solutions required are (*a*) a ten per cent. solution of caustic soda and (*b*) a ten per cent. aqueous solution of potassium iodide saturated with iodine. To five cubic centimetres of the distillate of the urine in a test-tube add ten drops of the caustic soda solution and warm gently; then add, drop by drop, the iodine solution till a permanent yellow tint is got. More of the caustic soda is next added till the solution is once more decolorized, when, if acetone be present, precipitate of iodoform will occur, thus:

$$C_3H_6O + 4NaOH + 3I_2 = CHI_3 + NaC_2H_3O_2 + 3NaI + 3H_2O.$$

The precipitate can be recognized by its smell and microscopically by the appearance of the iodoform crystals (hexagons and six-rayed stars). But commonly as acetone occurs in the more severe forms of diabetes, it is certainly not the cause of the coma, as large quantities of it have been taken experimentally without producing stupor, and it is met with in various other diseases where coma does not occur. The presence of acetone in the urine of the diabetic is, in my opinion, to be looked upon as an indication that metabolism is much perverted. It is essentially a product of increased proteid-destruction in the organism while at the same time it is associated with a perverted metabolism of carbohydrates. The amount excreted may reach from 0.6 to 0.8 gramme per diem, according to Hirschfeld, while in health small traces (*e.g.*, ten milligrammes) may be found.

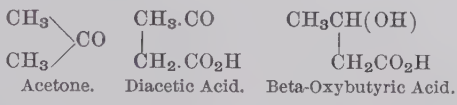
Diacetic or aceto-acetic acid has the formula $CH_3.CO.CH_2.CO_2H$, and is acetic acid wherein one atom of hydrogen in the methyl group has been replaced by the radical acetyl, $CH_3.CO$. Diacetic acid is met with under various pathological conditions and most commonly of all in diabetes. When pure, it is a clear, colorless fluid, with a pleasant ethereal smell, and readily volatilized by heat. It can be easily detected by Gerhardt's test. The urine employed should be fresh. The test is simple, consisting in the addition, drop by drop, of a weak solution of perchloride of iron. At first a whitish-gray precipitate of phosphates appears. If this be filtered off and a little more perchloride added to the filtrate, the presence of diacetic acid will be indicated by the development of a fine claret-red color. Since acetates, salicylates, and certain other drugs may also strike red with an iron persalt, the test may be repeated after the urine has been boiled, when the red color will no longer be obtained if it at first were due to diacetic acid, since that acid is dissipated at the temperature of boiling urine. Arnold has recently suggested a new and delicate test for this body, in which an acid solution of para-amido-aceto-phenose is employed along with sodium nitrite. Unfortunately, it is a little complex for clinical work and the solutions must be freshly prepared each time, so that, as a rule, recourse is still had to Gerhardt's reaction. The modification of Arnold's test recently proposed by Lipliowsky is still more elaborate.

As will be noticed on comparing the formula and constitution of acetone with those of diacetic acid, the latter is equal to the molecule of acetone less CO_2. There is an affinity between them, both physical and chemical, and, as a rule, they occur together in severe cases of diabetes, and in quantitative work they are usually estimated together. Looking over my notes of the last thirty-five examinations made to determine the presence of these compounds in diabetic cases, I find that acetone is recorded as being present on thirty occasions while diacetic acid was found twenty-five times at the same examination, the amount several times being small. On no occasion was diacetic acid present without acetone.

Now, this acid has also been considered in reference to the coma, but its internal administration produces no serious symptoms, and it, like acetone, may be met with in morbid conditions which are not accompanied by stupor. It has, therefore, like its

confrère acetone, come to be regarded rather as an indication that the case is a well-marked or severe one than as a pathogenic body.

Beta-Oxybutyric Acid, its Chemistry and Clinical Import.—Great interest has been aroused by the presence of this abnormal compound in the urine of diabetics, the more so because it is generally found in all very grave cases, is found frequently in large amount, and is regarded by perhaps most clinicians as playing an important part in the pathogenesis of coma. Its formula is $CH_3.CH(OH).CH_2CO_2H$, and its relations to acetone and diacetic acid are as follows:



Acetone. Diacetic Acid. Beta-Oxybutyric Acid.

It is now considered that the former two may arise from oxidation of the last named. Acetone, however, is frequently met with without oxybutyric acid, and in these cases either the acetone has another source or else the oxybutyric acid has been thoroughly oxidized and none is excreted as such. In those instances, then, where we find a considerable quantity of oxybutyric acid, it may possibly be due to a defective metabolism, as far as oxidation is concerned, in the diabetic. It is not a constituent of normal urine, and, whereas acetone may be made to appear in the urine of the healthy by abstaining from carbohydrates, it is not easy to cause oxybutyric acid to appear. Nebelthau was able to demonstrate its presence in a case of gastric disorder with marked emaciation.

The acid content of diabetic urine is high, and this is to be ascribed to the presence of oxybutyric acid aided in a less degree by diacetic acid. One need not be surprised at this, considering that repeatedly from twenty to thirty grammes or one ounce of the former acid have been excreted in twenty-four hours. In fatal cases the amount of the acid usually steadily increases, at least till the onset of the symptoms. Another interesting point in this connection is the large amount of ammonia which is usually found in diabetic urine. In health from 0.6 to one gramme is excreted in a day, but in diabetes the amount may be seven or eight times as great; even ten grammes and more have been noted. This large excretion is called for to supply a base for combination with the abnormal acids, especially oxybutyric acid, because there is not, as

a rule, a sufficiency of potash and soda in the food to supply the requisite alkali. Indeed, Stadelmann has suggested that the estimation of ammonia, which is comparatively easily made, might take the place of that of oxybutyric acid, so intimately is the presence of the one associated with that of the other.

It was formerly held, and with a certain amount of reason, that the alkalinity of the blood was lessened in diabetes. Recent work, however, has gone to show that in the majority of cases this is not so *except when coma supervenes;* then the alkalinity may sink much below the normal.

As regards the source of these abnormal elements, the opinion of many is that they owe their origin to the breaking down of proteids, especially in cases where there is great emaciation. It has also been suggested that some toxic substance may act on albumin producing the acids. Geelmuyden, on the other hand, suggests that they may arise from fats, and especially marks these out as the source of oxybutyric acid. A third suggestion is that they are produced synthetically in the body, just as hippuric acid is from the union of glycocin and benzoic acid. I shall have to refer to this subject again.

No other abnormal acids occur in diabetic urine. Pye-Smith, indeed, in the last edition of Hilton Fagge's "Practice of Medicine" (1901), states that crotonic acid ($CH_3.CH.CH.CO_2H$) also is found; but, although it is closely allied in many ways to oxybutyric acid, it has not, so far as I am aware, been discovered as such in diabetic urine.

The Detection of Beta-Oxybutyric Acid.—The acid itself is a thick, syrupy substance, and is not nearly so volatile as acetone or diacetic acid, though it can be volatilized in a current of steam. Its presence may be surmised when after completely fermenting diabetic urine it is found that the plane of polarization is rotated to the left, for the acid is lævorotatory. Further if, when estimating the sugar quantitatively by Fehling's method, it is found to be greater than when determined by the polariscope, one may suspect that the acid is present, its lævorotatory power diminishing the dextrorotatory activity of dextrose and so giving too low a reading. Chemically it is identified by converting it into alpha-crotonic acid, which it becomes by losing a molecule of water, and the method which I have always employed is that devised by Külz. The process is as

follows: about one hundred and fifty cubic centimetres of the urine are fermented fully by yeast, to remove all the glucose, and filtered. The sugar-free filtrate is concentrated to a syrupy consistency by gentle evaporation. To this syrup an equal volume of concentrated sulphuric acid is added and the mixture distilled, when, if oxybutyric acid were originally present, it comes over as alpha-crotonic acid. This is received in a cold test-tube, and may at once deposit itself in fine crystals on the inside of the tube. In other cases a clear fluid distillate collects, from which the acid may be removed by shaking with ether. The ethereal extract is pipetted off and allowed to evaporate at room temperature, when the presence of alpha-crotonic acid will be shown by a deposit of feathery acicular crystals whose melting point is 72° C. Occasionally it crystallizes in prisms, and I have obtained both forms. In thirty-six examinations made on twelve cases of diabetes, most of them severe, I found it present on eighteen occasions, the amount being distinct nine times and scanty nine times. In one case ending fatally by coma, which was examined only twice, it was found in the urine the first time, but in the second specimen, removed by catheter after coma had begun, I found none. The distillate in this instance had a peculiar fruity odor, which I had already noticed in another case ending with coma, where again oxybutyric acid appeared to be absent. It is possible that some other organic acid was present in these cases, for, as I shall point out, other substances besides oxybutyric acid have been said to produce coma.

The Relation of Beta-Oxybutyric Acid to Coma.—It is to Stadelmann particularly that we owe the suggestion that the coma is due to this acid. The generally accepted view is that we are here dealing with an acid-intoxication (sometimes termed *acidosis*). According to Stadelmann, this acid, often produced in large quantities, cannot obtain from the body enough potash or soda for its neutralization. It, therefore, unites with ammonia (which explains the high ammonia excretion in diabetics), and this in its turn results from an altered metabolism of the proteid food which under ordinary circumstances would have been excreted as urea. If now, as a result of gastric disturbance (often noticed at the onset of coma), too little proteid is ingested, the oxybutyric acid is deprived of its requisite base, and accumulating in the blood causes a stupor. In support of this view is the fact, proved experimentally by Walter,

that the introduction into the system of large quantities of dilute mineral acids, such as hydrochloric, can cause the onset of coma and dyspnœa in dogs and other animals. It is further supported by the benefit which has been derived in cases of coma by the subcutaneous or intravenous injections of saline alkaline fluid or by the oral administration of large doses of sodium bicarbonate. And, lastly, there is the result of experimental work, where it was possible to produce coma by injecting the acid into dogs. The presence of the acid is supposed to diminish the solvent power of the blood for carbon dioxide, which thus accumulates in the tissues and produces narcosis.

On the other hand, it has been pointed out that coma may occur with an absence of oxybutyric acid and that it has been administered in large doses to a dog whose pancreas had been removed (Lépine), without any markedly toxic effect.

Other Substances as the Cause of the Coma.—A year or two ago Sternberg raised the question as to whether beta-amido-butyric acid ($CH_3.CH.(NH_2)CH_2.CO_2H$) might not be the cause of the coma. He found that the alpha- and gamma-acids of this series were comparatively inert, while the beta-acid produced in animals deep insensibility, labored breathing, and increased blood-pressure. These effects he was able to produce with doses of three grammes. Shortly after this Grube published the results of some experiments undertaken for the purpose of testing Sternberg's opinion; these were in general favorable to the latter's views. He was able, by injecting the acid into cats in large doses, to produce a coma-like state with a change in the respiratory type resembling that met with in diabetes. Further, the circulation was affected, the force of the heart's beat being increased while the blood-pressure was not altered. Control experiments were negative. Not infrequently acetone appeared in the urine of the animals receiving the acid.

Lépine, in a paper published about this time (the end of 1900), also considers the likelihood of beta-amido-butyric acid being the agent of the toxæmia. He admits that it has not been demonstrated in the urine or organs, but considers that it may be an intermediate step in the production of beta-oxybutyric acid from proteids. It happens too that beta-amido-butyric acid on hydration gives rise to beta-oxybutyric acid and ammonia, thus:

$$CH_3CH.NH_2.CH_2CO_2H + H_2O = CH_3CH.OH.CH_2CO_2H + NH_3,$$

and Lépine thinks that this may in part explain the high ammonia excretion met with in diabetics. Beta-amido-butyric acid is itself a hydration product of nitrile amido-butyrate, which, in contrast with the former substance, is innocuous. Other chemical bodies of known composition have also from time to time been suggested as the cause of the coma, among which may be mentioned trimethylamine ($N(CH_3)_3$), proposed by Senator, and paraldehyde ($C_6H_{12}O_3$), suggested by Latham.

Schmitz some ten years ago propounded the view that the coma developed as a result of an autointoxication from the bowel, and pointed to the frequency with which constipation occurs in diabetes. Further, he claimed to have cured a case by the simple use of castor oil, one teaspoonful every hour, the contents of the bowel which were evacuated being very offensive. But it is obvious that this view can apply to only a limited number of cases, for coma may come on in instances where the alvine evacuations are quite regular, and in cases of threatened or developed stupor it is a general plan to empty the bowels at once, unfortunately only too often without any benefit to the patient.

Lastly, it may be mentioned that Klemperer (and to some extent von Noorden) is inclined to attribute the fatal ending to a toxin developed within the system as a result of the destruction of albuminous substances. In general, however, the opinion most widely accepted at the present time is that the coma, especially in its typical form, is due to slow acid-intoxication of the system, the most probable cause of which is the increasing production of beta-oxybutyric acid coupled with its defective neutralization and oxidation, while a few observers incline to the view that beta-amido-butyric acid is the harmful element.

The General Symptoms of Coma.—It is not my intention to discuss in detail the clinical aspects of coma, but I may point out that three types of it are usually recognized. (1) The typical and most common form, often met with in young subjects, is that in which the symptoms develop with comparative suddenness. To begin with, the patient complains of digestive disturbance and vomiting, abdominal pain, muscular weakness, and drowsiness which

passes into coma. The breathing is often deep, though not rapid, as if the patient were longing for air; this constitutes the "Luft-hunger" described long ago by Kussmaul. Death may occur in about twenty-four hours. (2) There is a form where the condition often occurs after fatigue, especially in elderly diabetics, and is characterized by collapse, subnormal temperature, and a rapid, weak pulse. (3) Lastly, there is a third variety, in which the gait is ataxic, the speech confused, and alcohol has been found in the urine. It is in the first of these forms that the urine contains large quantities of beta-oxybutyric acid.

The Treatment of Coma.—In the way of prevention, efforts must be directed towards sparing the patient fatigue, mental worry, nervous shock, and those other conditions which have been known to precipitate an attack. It has now come to be recognized that a diet too rigid in proteids is more harmful than good. To supply a carbohydrate Morré strongly recommends potatoes, three pounds of which are in carbohydrate value equivalent to one pound of ordinary bread, and in addition contain six times as much water and three times as much mineral matter. He has used them for five years in the treatment of diabetics, and finds that they are well borne and improve the general condition.

When it is obvious that the comatose stage is commencing, there are three therapeutic measures open to us. (1) The administration of large doses of an alkali,—*e.g.,* from fifty to one hundred and fifty grains of sodium bicarbonate thrice daily. This has been followed by at least temporary improvement. (2) The introduction of normal saline solution or, better still, of a saline alkaline solution into the veins or the subcutaneous tissue. If a saline solution alone is used, it may be made by dissolving one teaspoonful of common salt in one pint of sterilized water raised to a temperature of from 98° to 100° F. When the alkaline solution is used, an addition is made of one teaspoonful of sodium bicarbonate. The fluid may either be run into the median basilic vein or into the subcutaneous tissue where this is loose and abundant. Cases have been reported by Fagge, Taylor, Oliver, T. K. Monro, and others in this country, where undoubted benefit occurred, and in all grave cases this should be tried. (3) I have seen slight benefit follow temporarily the inhalation of oxygen, but I have not seen or heard of any case where it produced more than a transient effect.

Last year, Schwarz, of Prague, suggested that *gluconic acid* might be used in the treatment of the coma. Gluconic acid ($C_6H_{12}O_7$) is formed by oxidation of glucose with bromine water. Schwarz used it in a case where coma occurred twice in the same subject, and where recovery took place each time under the administration of from fifty to seventy grammes of gluconic acid in alkalinized water while at the same time large doses (one hundred and forty grammes) of sodium bicarbonate were administered by the mouth and bowel. A third attack supervened in which no gluconic acid was available, although the soda was, and in this one the patient succumbed.

In conclusion I may say that Lépine, considering the possibility of beta-amido-butyric acid being the poisonous body, has suggested that some phenol might be administered by which the acid might be converted into a harmless nitrile within the tissues (nitrile-amido-butyrate itself is innocuous). The phenol treatment of diabetes, however, has not been very successful, although antipyrin and phenacetin have been used a good deal in France.

AORTIC ANEURISM.

CLINICAL LECTURE DELIVERED AT COOK COUNTY HOSPITAL.

BY ROBERT B. PREBLE, M.D.,

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GENTLEMEN,—This man is forty-seven years of age; German; his previous health has been good, and in his past history we find only one thing which has a bearing on his present condition,—namely, a venereal ulcer twenty years ago. So far as he knows, he has never had any secondary or tertiary manifestations of syphilis. He is married and has two healthy children. The first thing noticed on examining him is asymmetry of the pupils. The right pupil is larger than the left, and has been so ever since he first appeared at the clinic. On closer inspection we observe also the Argyll-Robertson pupil. His pupils do not react to light, although they respond promptly to accommodation. The man's nose is saddle-form, but this he traces to an injury which he sustained some fifteen years ago.

There is nothing particularly striking upon inspection of the chest, except that the apex beat is seen in the sixth interspace and anterior axillary line approximately. There is no evidence of tumor; no visible pulsation except that derived from the heart. There is no evidence across the chest of any collateral circulation, such as is present in many cases of aortic aneurism. We find nothing upon palpation; no thrills, no fremitus, but simply an active, vigorous pulsation of the heart.

Upon percussion we find manifest abnormalities, and among them an abnormal area of cardiac dulness. Here, about the mid-sternal line, is the right border of the cardiac line; it extends over to the left of the apex beat and passes in a curved line upward and across the sternum. Superimposed upon the increase in size of the heart we detect a considerable area of retrosternal dulness. Percussion of the chest elsewhere elicits nothing. The percussion note over both lungs is normal. Upon auscultation of the heart,

we find over the entire area a loud systolic murmur, whose point of maximum intensity is approximately over the apex. As we pass upward we can hear also a diastolic murmur, which increases in intensity until it reaches its maximum at the sternum on a level with the third rib. The second pulmonic tone is not accentuated; the second aortic tone is replaced by a murmur. Auscultation of the lungs shows very little,—only that over the entire left side the respiratory murmur is less intense than on the right side. The difference is not great, and there is no corresponding difference in the voice sounds or in vocal fremitus. The pulses present a number of interesting phenomena. Those of you who are near enough can see readily the brachial in this arm, but even on closer inspection you will be unable to see the brachial of the left arm. The right artery is not only thickened, but also lengthened, and with each pulsation moves up and down. It is a well-marked pulsus ambulans; yet on the other side the symmetrical vessel is almost invisible. One is impressed with the quickness with which the artery fills and empties. When we carry on a comparison with the vessels further down the wrist, we find asymmetry of size and form of the pulses, which is relatively shown in the sphygmographic tracings which I have had prepared. The tracing of the left wrist is smaller and the pulse has lost entirely the characteristic of celerity. It has changed its shape as well as its size: its apex is no longer sharp, but rounded off. A peculiarity not shown by the tracings is that the left radial pulse is retarded: it comes an appreciable interval after the right. The left carotid also appears later than the right. The femoral pulse likewise is retarded; so are the pulses in all vessels which arise from the aorta beyond the origin of the innominate. The right carotid and right radial are synchronous with the apex beat. In a good light the capillary pulse can be made out.

Besides the Argyll-Robertson pupil the patient shows fairly well the Romberg symptom. There is entire loss of the knee-jerk. In addition to the visceral findings, he presents the three cardinal symptoms of locomotor ataxia, from which, however, he has no subjective disturbances. He has never had any shooting pains, no girdle sensation, no bladder or rectal disorders, and no impairment in his gait.

Diagnosis.—This man has an aortic insufficiency due to arterial

changes, which is altogether different from the aortic insufficiency seen in the young as the result of endocarditis. The systolic murmur here is of no significance whatever, because it is one of the murmurs heard in all cases of aortic insufficiency, whether of arterial or endocardial origin. The patient also has an aneurism of the aorta, which arises not from its ascending portion, but from that part beyond the region of the innominate, sufficiently large to affect the point of origin of the left carotid and left subclavian vein. A diagnosis of aneurism cannot be made absolutely in this case, because of all the possible symptoms of aneurism the only one which is peculiar is not present here,—that is, tumor with a distinct expansile pulsation. If we found that symptom, there would be no risk in making a diagnosis of aneurism. I am confident, however, that we have to do with an aneurism, because of all mediastinal tumors aneurism is the only one which is common; furthermore, of those which develop under the mediastinum aneurism is the only one usually found in a man of his age. He has had syphilis, which, however, showed itself by no secondary manifestations, and there are in this case two other conditions that are frequently the result of late syphilis,—namely, aortic insufficiency and tabes. Of all causes of aortic aneurism syphilis is the most potent factor: I believe that eighty per cent. is a conservative estimate of the number of cases of aneurism of the aorta that are syphilitic. Though dulness and asymmetry of the pulses may come from any other tumor in the mediastinum, I do not hesitate, after considering the concomitant conditions, to say that this is a case of aneurism of the aorta. Tabes here shows itself by the Argyll-Robertson pupil, by the Romberg symptom, and by a loss of the knee-jerk. The larynx does not show much. The patient states that sometimes he becomes hoarse. Examination of the larynx, however, does not show any paralysis of the left vocal cord, though in phonation it is a little out of position.

The man refers to only one subjective complaint,—namely, that he is short of breath and has been for the past eight months. At first his dyspnœa was only at intervals; at other times he could not sleep on account of it. As time has gone on, the difficulty in breathing has increased. Now there is dyspnœa on exertion. For example, when he got here he was quite out of breath. Recently he has developed a limited œdema of the extremities and of the arms.

I believe these are all the phenomena which this man presents. The case is of interest because it shows so many of the late manifestations of syphilis,—aortic insufficiency, aortic aneurism, and tabes.

He has had practically no treatment. He has been unwilling during the past two or three weeks to take any advice from us. We advised him to go to the hospital, where his condition could be better controlled and the surroundings would be much better, but he was unwilling to do so. He was put upon such treatment as we could give him considering that we saw him only once a week. But he has now consented to go to the hospital, and we hope to put him in such a condition that he will be at least comfortable, if not able to be on his feet and do a little work. The prospect of a cure is not to be thought of. It is possible, even for a man who is in a much worse condition than this patient, to gain strength sufficient to enable him to return to work.

EXPERIENCE GAINED FROM POST-MORTEMS IN RELATION TO THE PRACTICE OF MEDICINE AND SURGERY.

BEING SLIGHTLY MODIFIED FROM AN INTRODUCTORY LECTURE DELIVERED TO THE AUTHOR'S CLASS OF PRACTICE OF MEDICINE AT THE OPENING OF THE WINTER SESSION, 1901–'02.

BY ROBERT A. FLEMING, M.D., F.R.C.P.E.,

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Gentlemen,—Few general practitioners realize how much they lose by their want of post-mortem experience, and the mistake can only be rectified before a professional career is started. The man who builds a ship studies all the many details of construction which help him to achieve the best results; yet few medical men take the same interest in the pathological changes which underlie the physical signs and symptoms that they constantly study clinically. While a large percentage of ailments can be investigated by blood-counting, urinary analysis, and so forth, there are at least an equal number which can be studied exhaustively only in the post-mortem room; and certainly the secret of many clinical phenomena is only yielded up there. The physical signs are the results of pathological changes, and, while it may be possible by long clinical experience to recognize the disease, it is only by repeated post-mortem examinations or the opportunity of seeing a large and varied collection of fresh specimens of the conditions in question that we can realize the full significance of the physical signs noted. My object in bringing forward this subject is to urge upon every man who desires honestly to perform the duties of a physician or surgeon the importance of making himself as efficient a pathologist as possible, remembering that in many cases it is only from a thorough grasp of the pathological changes which underlie disease that accurate diagnosis and prognosis are possible.

Few medical men choose to ask for a section in their private practice, and when they make such a request they do not care for very obvious reasons to do the work themselves, while pathologists

are not always to be obtained. Medical students once passed the portals of graduation too often rush into practice and never get the chance of any post-graduate experience in pathology.

Perhaps physicians suffer more than surgeons from the want of practical pathology, and the wonder is why so many men have passed from pathologistships to staff appointments in our hospitals without each and all raising their voices against the prevailing condition of things. Now that pathology is becoming more and more a specialized department from which it is thought inconsistent to advance to a clinical appointment, less opportunity is being afforded year by year for physicians and surgeons to get the pathological training they ought to receive; and as time goes on specialism will make this increasingly worse instead of better unless practitioners realize what they are losing and do something to rectify matters.

How it is possible during the rush of a five years' curriculum with ever increasing classes, theoretical and clinical, to get such a comprehensive grasp of morbid anatomy as to be able to dispense with it almost altogether in after life, is past comprehension, and the misfortune is that there is a failure to appreciate the enormous importance of post-mortem examinations. The writer's personal experience certainly shows the great value of the post-mortem room, because hardly a single section was performed during his four years' tenure of office as pathologist to the Edinburgh Royal Infirmary without something new being learned or some point being confirmed. The writings of specialists who have never devoted much time or attention to post-mortem work inevitably lack the accuracy which they might have had with a pathological training. That there are many good men who have never been pathologists is, of course, true, but that they would have been still better men had they but had the experience which the post-mortem room alone gives is absolutely beyond the realm of controversy.

It is only requisite to take a few of the many diseases which are daily seen in practice to provide all the premises necessary to prove our argument.

In the bronchopneumonic type of pulmonary phthisis nothing is so essential to a right comprehension of the disease as the study of the many pathological changes which may occur in the affected lung. The size and appearance of the racemose areas of caseous

tubercle, their site, the changes in the surrounding lung, and the formation and favorite position of cavities are all points of great importance to the clinician. Text-books too often lead the student to expect a big area of consolidation in phthisis pulmonalis, and the young medical man fails to grasp the importance of small recent areas of caseating tubercle with little definite dulness, unless he sees them for himself. The clinician is apt from book knowledge to look for cavities at or near the apex of the upper lobe, while the pathologist expects to find them far more frequently in the portion of lung situated just below the clavicle. The whole of the changes in both acute and chronic phthisis can never be properly appreciated until they have been studied in a great variety of fatal cases; in fact, the more experience we get, the more detail, not merely of pathological but also of the utmost clinical value, will be acquired. Especially are the old cicatrices found to mark the sites of obsolete tubercles, which often prevent full expansion of the chest on the affected side, very misleading if not seen repeatedly in the post-mortem room. Pleural changes are equally puzzling until studied at numerous sections. Thickening of the pleura is perhaps of all pleural conditions the one in which most help is obtained in the way I have just stated. Then how often do physicians talk of bronchiectatic cavities being common in fibroid phthisis and other conditions, but how seldom does the pathologist find them in cases where they are expected to be present? The writer saw two well-marked cases in one month, but in over one thousand post-mortems he can recall only one other really typical case.

In pleural effusions of long standing, or of any duration at all, physicians are apt to talk glibly about the re-expansion of the lung after the removal of the fluid, quite forgetting that fibrous changes take place in the visceral pleura, especially in the layers of fibrinous lymph, which may render re-expansion either very difficult or often impossible; and nothing demonstrates this so perfectly as post-mortem examinations of lungs so compressed. Even in an ordinary lobar pneumonia the physician can learn much from studying the condition of the hepatized lung, while it is only in the post-mortem room that one can grasp the amount of ante-mortem blood-clotting which is so common in fatal cases, and which I believe is sometimes a cause of death in that disease.

Post-mortem experience corrects what may be described as text-book errors,—mistakes which are apt to find their way into the most carefully written volumes and to be copied from one book to another until they become almost classic. Among such errors I might mention the usual statement that the head of the pancreas is a common site of primary cancer. I think most pathologists agree that it is a rare location, while some go the length of asserting that carcinoma almost never begins in the head of the pancreas itself, but always in some glandular structure in its immediate vicinity. Another statement is that cancer of the cardiac end of the stomach causes atrophy and consequent decrease in size of that organ, while the post-mortem room demonstrates that, while such atrophy may occur, it by no means follows that a cancerous tumor of the cardiac end of the stomach must so seriously constrict the lumen of the viscus as to bring about this reduction in size.

I hold that in the diseases of every system of the body the post-mortem room can teach nearly as much as the bedside clinic, and that a pathologistship is the best training a man can have for grappling with disease, whether we are thinking of diagnosis, prognosis, or treatment. Surgeons may learn much, but I believe physicians can learn more from the post-mortem room, and this is partly attributable to the fact that surgeons in operating see the nature of the pathological conditions with which they are dealing. In fatal abdominal cases, however, where there are drainage difficulties the section often suggests something to be done differently on a future occasion. I can recall one such case where an appendiceal abscess had been opened and a drainage wound made in the lumbar region to remove a considerable amount of retroperitoneal pus; at the post-mortem it was found that the pus had failed to discharge freely owing to the opening not being at the most dependent part, with the result that it had burrowed upward and involved the retroperitoneal tissue around the right kidney and had even reached as far up as the diaphragm. I might multiply instances of cases in which the section proved of the greatest value to physicians and surgeons alike, but I fancy that I have said enough to prove my point.

It would, however, be hardly fair to omit all mention of what may be truly termed unsatisfactory sections, and every pathologist has met with them in the course of his experience. I refer to

cases where the cause of death remains mysterious even after the most thorough and painstaking post-mortem, pursued not merely macroscopically but also microscopically. There is not much satisfaction in calling these cases toxæmic, yet they probably are so. Such examinations often reveal an apparently fairly healthy condition of the heart and lungs, with little abnormality except a patch or two of lobular pneumonia. That a careful measurement of the cardiac orifices would show some dilatation, suggesting cardiac failure, is, I believe, often true; but these cases are nearly all really toxic, and the true key to the secret is probably to be found only when we know more of bacteriological chemistry. But even counting carefully all these unsatisfactory cases, and they are a very small and insignificant number, I cannot help thinking that every impartial medical man must agree that I have a very strong case, albeit perhaps very feebly set forth.

What is to be done? My object in writing this paper was in no sense of the word to cast any slight on our Edinburgh medical curriculum and system of fitting men and women for their life-work in the field of medicine and surgery. All our professional schools are guilty, so far as my knowledge goes, and Edinburgh less so than most; but that is not saying much. What can we do? We cannot arrest the specializing tendency as regards pathology, but we can offer every incentive to young graduates to study pathology not for passing examinations merely but to learn the groundwork of disease, and this they can do only from morbid specimens. An increase in the number of assistant pathologists could not embrace many men and would be cumbrous in the efficient working of the department; but men should be encouraged to take acting clerkships in the post-mortem rooms for periods of from three to six months, and so keen ought the competition to be for these posts that the very best men should be available in every medical school.

The other suggestion, one which fits the needs of large numbers of men, is to give demonstrations of morbid specimens not merely at the time of the section but at a later hour, when the audience in place of being undergraduates would be entirely men who have already passed their degree examinations. This plan is adopted to some extent in Vienna and other schools, but it might with advantage be more widely carried out, and it is only at certain seasons

of the year that such post-graduate demonstrations would need to be held to meet the requirements of my scheme.

No man who devotes one or two years or even longer to pathology before commencing practice will feel that he has wasted his time; on the contrary, he will have gained more confidence in grappling with the many problems which disease presents to him, and he will possess an experience of greater value than could be derived by ten years of clinical work without the aid of the post-mortem room. However much, in my opinion, post-mortem work has been neglected in the past, the recent specializing tendencies with regard to pathology have induced me to print this paper, with the hope that the all-important matter of pathological experience may be pressed on the attention of all who read these lines, and that arrangements may be made at every great medical centre for the better instruction of young graduates in the subject upon which their professional success so largely depends.

BRADYCARDIA; CYCLIC ALBUMINURIA.

CLINICAL LECTURE DELIVERED AT THE CHICAGO POLICLINIC HOSPITAL.

BY JOSEPH M. PATTON, M.D.,

Professor of Internal Medicine, Chicago Policlinic; Associate Professor of Medicine, Medical Department, University of Illinois, etc.

Gentlemen,—This man presents an interesting form of cardiac neurosis,—namely, true bradycardia, a permanent condition of slow pulse, which must be distinguished from the so-called false bradycardia due to a varying number of hæmosystolic actions in which the pulse-wave is not of sufficient force to reach the peripheral arteries. This pseudobradycardia is not infrequently associated with the ataxia of chronic cardiopathies, in which case the pulse is most likely to assume the form of the pulsus alternans bigeminus or trigeminus.

For one who is sixty-two years of age, the patient presents a condition of good general nutrition and health. He has never before had any serious illness, and for thirty years had not lost a day from business because of sickness. He has never used tobacco or liquors to excess, and has not used either to any extent for years Nine months ago he suffered from a moderately severe attack of influenza of about a week's duration, followed by marked prostration, dizziness, tendency to syncope when on his feet, and there was œdema of the legs. I then saw him for the first time. His heart was moderately enlarged; the apex beat presented in the sixth interspace, one inch to the left of the mammillary line. The cardiac impulse was diffuse, not forcible, and there existed a slight relative mitral regurgitation. The first sound was lacking in muscular tone; the second was relatively intensified at the apex and actually so at the base. The pulse was 34 per minute, his ordinary rate being 76. The liver was slightly enlarged and moderately tender on palpation. There was marked œdema of the feet and legs. He had but little dyspnœa and no cough. The radial and temporal vessels showed evidence of a slight degree of sclerosis. He was passing daily from

thirty-two to thirty-six ounces of urine, which was of a pale-amber color; specific gravity 1018; total solids diminished; urea 1.5; a slight amount of albumin; no casts. He was kept in bed for three weeks; was given a milk diet, daily massage, and one grain of spartein sulphate, with one-twenty-fifth of a grain of strychnine sulphate, every six hours; also three grains of sodium iodide three times daily. He then felt much better; the pulse-rate had increased to 42 per minute; there was less œdema and no tendency to syncope. He was given a little exercise by walking. The strychnine was reduced to one-thirtieth of a grain and spartein to one grain thrice daily. The sodium iodide was discontinued soon afterwards, but for the last eight months he has taken spartein and strychnine at intervals.

As you see, there is no œdema. The apex beat is under the sixth rib just outside of the mammillary line. The pulse is 46 per minute. There is no dyspnœa, no mitral murmur, and, feeling comparatively well, he is able to attend to some business without difficulty.

Lately, without actual loss of consciousness, he has had attacks of syncope, lasting for a few minutes, accompanied and followed by marked prostration. The pulse during and after these seizures has been as low as 26 per minute, but gradually rises to the usual rate of 42 to 46. The urine at present is normal; for some time it has contained no albumin. It is probable that the albuminuria was due to weakness of the heart. Intermittent albuminuria may occur in cases of bradycardia, when the pulse-rate sinks unusually low, as in a case reported by Whitridge in which the pulse sank to 32. In our patient there was no albumin, with a pulse of 36 to 42. There has been no opportunity to examine the urine immediately after the syncopal attacks, when the pulse was as low as 28. These attacks of syncope apparently are similar to those described by Adams and Stokes, the so-called Adams-Stokes syndrome, also denominated by Stokes as false or pseudo-apoplexy. Simple vertigo may occur several times a day; there may be occasional attacks of unconsciousness lasting five or six minutes. Most of the severe forms show marked arteriosclerosis, as in a case reported by Prentis, of Washington, in which the pulse varied from 11 to 40 per minute. In our patient we find no marked sclerotic changes.

Slow pulse occurs from irritation of the vagus, paralysis of the

sympathetic, disturbance of the cardiac centres, their exhaustion after acute diseases, such as typhoid or pneumonia, in meningitis from pressure, in jaundice from toxæmia, in epilepsy, in colic, in stenosis of the aortic and mitral valves, in coronary sclerosis from injury to the cervical portion of the spinal cord, in the puerperal state, in uræmic poisoning, or any poisoning, as from lead, tobacco, coffee, alcohol, etc., and from the action of digitalis.

Riegel divides the condition into physiological and pathological bradycardia, the former comprising the puerperal form, and bradycardia from hunger, etc. Huchard maintains that slow pulse is caused by changes in the vagi centres due to disease of the arteries of the medulla, resulting in a true bulbar ischæmia, which he calls the cardiobulbar form of arteriosclerosis. Balfour considers slow pulse to be due to cervical inhibition acting through the accessory nerves, and not to any cardiac lesion, the possibility of an idioventricular rhythm from vagus inhibition arguing against the latter condition as a cause of slow pulse. Prentis ascribes slow pulse to disease or injury of the nerve centres, of the pneumogastric or sympathetic nerves, of the cardiac ganglia of the heart muscle, and the action of poisons or toxins. Temporary disturbances of the cerebral circulation, which are common in subjects of arteriosclerosis, may be responsible for the syncope and apoplectiform attacks. But in view of the probable myogenic nature of the cardiac action, the possible *rôle* played by the various conditions of toxæmia in relation to rhythmic disturbances of the heart becomes an interesting question, especially when we consider that no definite pathological conditions of either the heart muscle or the nervous system can be constantly associated with abnormal heart rhythm. Bradycardia is a relative term. A pulse under 50 may be termed bradycardia. It is more common in men than in women. It is usually a senile manifestation, though it is occasionally found in early life. The pulse may be as low as 8 or 10, though from 25 to 30 is a more common rate. This patient does not appear to suffer in any special way from the slow pulse-rate. Slow pulse may last for a lifetime, or the pulse may become normal after a few months or years. Usually, after a greater or less length of time, attacks of syncope or epileptoid attacks, such as occur in this patient, develop, and in one of these the patient succumbs.

The relation of the attack of influenza to the development of

bradycardia in this case is interesting. Various kinds of cardiac arrhythmia have been observed after influenza. Slow pulse following influenza has been noticed by Bunch, Saundby, and others. Sansom says that the most common cardiac sequel of influenza is tachycardia, and that bradycardia is less common; it may occur as a paroxysmal or permanent manifestation, and is the most dangerous because likely to result in fatal syncope. On the other hand, Saundby says that bradycardia occurs more often than tachycardia as a sequel of influenza. My own experience has been that temporary tachycardia, with a pulse continuously over 120 per minute, is the most common derangement of cardiac action after influenza. Next to this are paroxysmal manifestations, with a pulse of over 140 per minute. If we agree with Chase, that a cardiac rate of 60 constitutes bradycardia, we will find many cases of bradycardia after influenza.

The treatment must be largely symptomatic. In cases with marked vascular sclerosis we may follow Huchard's advice and give nitroglycerin or the iodides of potassium and sodium. Nitroglycerin should not be given unless the sclerotic condition of the vessels is marked. In true bradycardia digitalis is permissible if the pulse is flat and vascular tension is low; if the heart muscle is weak and tension high, digitalis may be given in connection with vasodilators, nitrite of sodium in small doses or opium being the best. Belladonna may increase the pulse-rate, but should be used cautiously. In bradycardia with scanty urine Douglas Powell advises caffeine. In bradycardia following Graves's disease, influenza, or diphtheria the treatment must be modified with reference to the previous or associated conditions. In the present instance we employ strychnine and spartein because the former is always safe and an efficient tonic of the heart muscle, no matter what the weakness may be due to, and spartein is especially of value as a heart stimulant in cases of toxic or nervous derangement of the cardiac action.

CYCLIC ALBUMINURIA.

This man is twenty-six years of age. As you see, he appears to be in perfect health and physical condition, and his own statements in regard to his previous health and present condition contain nothing to the contrary. About one year ago he applied for life insurance, and was rejected because of the presence of albumin in

his urine. He was then treated for a while by a capable physician, who finally told him that he was all right and that there was no albumin in his urine. Recently he again applied for life insurance, and was rejected for the same cause as before. At his first appearance here, two weeks ago, the urine passed early in the afternoon showed a considerable percentage of albumin; no casts; urea and total solids about normal; no sugar; specific gravity 1024; that voided immediately upon rising in the morning, however, was found free from albumin. Several samples since passed in the morning and in the afternoon show the same variation as to the absence and presence of albumin. We have here two specimens of urine, one of which was passed this morning immediately upon rising and the other since coming into the clinic room. I now lift a little of the last specimen in this pipette, which I lower into some nitric acid in this test-tube; removing the finger from the end of the pipette for a fraction of a second, allowing the column in the pipette to rise into view, you can see at the line of junction of the acid and urine a well-defined ring of albumin. The same procedure with the morning sample produces no result. It is possible that a more delicate test than this might determine the presence of a slight amount of albumin in the morning specimen.

The patient appears absolutely well in every other respect. There are no vascular changes; the heart is healthy, and the second aortic sound is not intensified. The presence of albumin in the urine, which was formerly regarded as evidence of Bright's disease, is now recognized as occurring under other circumstances and without marked organic changes in the kidney structures.

There are two classes of temporary albuminuria. In one group slight changes must be assumed to exist in the secreting structures of the kidney, such as febrile albuminuria, albuminuria associated with blood changes, as in purpura, syphilis, leukæmia, and toxic states of the blood, albuminuria of pregnancy, and neurotic albuminuria. The other group comprises the so-called functional or physiological cyclical albuminuria and the albuminuria of adolescence. There is much difference of opinion as to the presence or absence of any change in the secreting structures of the tubules in these cases. Normally nothing but the water and salts pass from the blood, and some maintain that any departure from this rule means a disturbance of the nutrition of the renal or glomerular

epithelium. Senator and others hold that there is a physiological albuminuria due to exercise, albuminous food, nervous states, cold bathing, and dyspeptic conditions, which is not connected with changes in the renal epithelium. Again, the cause has been assigned to variations in vasomotor influences which regulate the blood flow through the glomeruli.

In the postural form of cyclic albuminuria, such as we apparently have in this patient, Sterling thought the albuminuria due to shock to the kidney from the pressure of the column of blood above, when the patient rises from the recumbent to the upright position. Rudolph, while agreeing with Sterling as to the effect of posture, thinks that shock is not concerned in the production of the condition, but that the change in blood-pressure is a sufficient cause in connection with venous stagnation from a previous slight inflammation that has resulted in loss of elasticity in the vessel walls of the glomeruli, the increased blood-pressure of the upright position being sufficient to cause the passage of albumin through these functionally imperfect cells. We must recognize clinically the effect of variations in blood-pressure from vasomotor influences and gravity, as well as blood conditions resulting from improper food or imperfect digestion, febrile states, etc. How far the factor of gravity in relation to postural albuminuria depends on vasomotor influences, it is difficult to say. This man is not suffering from any special gastric disturbance. His exercise is not in excess of what good health demands. It is not possible to discover any neurotic element in the case. We must, therefore, attribute the condition to vasomotor influences in connection with a postural cause.

His treatment has been regulation of the diet and exercise, strychnine as a vasomotor tonic, and strontium lactate. The latter remedy was introduced as a drug that would modify or control functional albuminuria, or even that resulting from organic disease. It is slightly diuretic and by increasing the amount of urine may relatively lessen the amount of albumin. I have imagined that this constituted its chief effect in reducing albumin, and very careful quantitative analyses would be necessary to prevent an error in judgment. As all of the strontium salts have something of a general tonic action, there may be some good in the lactate aside from its supposed action upon the kidney cells. In the diet attention is

paid to regularity of meals, equal division of amount of food, not too much liquid with meals, and selection of food with reference to digestion mainly. Red meats are not prohibited. It has been shown that white meats contain as much nitrogen and other extractives as red meats, if not more; also the excretion of albumin in Bright's disease may be as great under a white meat diet as under a red meat diet. Cases of chronic Bright's disease do well on a moderate amount of either red or white meat. Therefore, in these cases the indication is to regulate the diet with reference to perfect digestion and improvement in the patient's general nutrition. Starch and sugar should be limited in amount. Meat may be allowed once a day, milk used as a beverage, and eggs given occasionally. The majority of these cases get well with careful attention to diet, exercise, and general hygiene, but unless you have also absolute control over the patient it is sometimes difficult to keep the urine free from albumin for a sufficient length of time to overcome the objection of the insurance companies. In many cases, after a few years of intermittent albuminuria, the albumin disappears entirely and cannot be found at any time of the day or night.

GASTRO-INTESTINAL AUTOINTOXICATION.

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PART II.

DIAGNOSIS.

As a rule, the diagnosis of a disease rests upon three factors,—(1) The symptoms, or the clinical picture; (2) the physical signs; and (3) the results of chemical or microscopical examinations of the secretions and excretions, blood, stomach contents, fæces, urine, sweat, etc.

(1) *The Symptoms.*—The symptoms most frequently observed in the beginning of autointoxication are disturbance of gastro-intestinal peristalsis, vomiting and diarrhœa in the acute cases, in others constipation, enteralgia, abdominal distention, coated tongue, headache, obscured consciousness, occasionally urticaria and erythema. Among the chronic conditions which have been classed as intestinal autointoxications,—ammoniæmia, hydrothionæmia, cystinuria, oxaluria, alkaptonuria,—the symptoms will be those of these conditions,—that is, if they produce symptoms at all. As a matter of fact, some of these states, particularly alkaptonuria, may exist without giving rise to symptoms. So much is evident; the clinical picture that has been given for intestinal autointoxication varies so greatly that it is impossible to make the diagnosis from the symptoms alone.

(2) *Physical Signs.*—The physical signs which have been ascribed to intestinal autointoxication are even more variable than the symptoms. Thus, there are disturbances of vision, varying from asthenopia to absolute blindness. Cardiac signs express themselves in irregularities of the pulse: this may be very fast or very slow or intermittent; it may be weak or of increased tonicity. The reflexes may be preserved, much impeded, or absent entirely. Thus, Ewald reports the case of a man, thirty-two years old, who was brought to

the hospital in a soporous condition, with the diagnosis of paraplegia. Two days after he was in the hospital he recovered consciousness; he stated that from two to four days before the attack he had been quite well. He took a glass of Hunyádi Janos water to relieve constipation. Soon after this he became sick and vomited offensive brownish masses; pains began to be felt; he grew apathetic, and too feeble to move or to answer to questions. The pulse was so weak that ether and camphor injections had to be given every hour on the night after his admission to the hospital. His weight diminished from one hundred and thirty-eight pounds to ninety-eight; his pulse was so feeble that it could not be counted; pupillary reflex was present, patellar reflex absent. Considerable quantities of a brownish, decomposed fluid were obtained from the stomach by means of the tube, and Ewald diagnosticated an advanced gastric dilatation. Patient entered the hospital April 3, 1895; under lavage of the stomach and dieting, he was so much improved by the 6th of April that he no longer fell over, as he previously did, on being removed from bed. The vomiting ceased, and evacuations occurred after irrigation of the colon. In the offensive fluid which was evacuated by the stomach-tube on the first day of his admission there was no hydrochloric acid nor lactic acid; but the acidity after the test-meal, which was given on the fourth day, showed free HCl equal to thirty cubic centimetres decinormal solution of NaOH; no lactic acid. Under continued lavage of the stomach and colon, the patient improved so much in two weeks that he regained possession of his mental and bodily forces; but he could not recall what had happened to him in the period immediately preceding his reception into the hospital. No tumor or enlarged glands were ever found in this patient, who was dismissed cured after fourteen days of treatment.

This clinical history is given with such detail because it represents, in Ewald's opinion, the type of grave autointoxication emanating from the stomach. A second type, which is presented by Ewald,[1] represents autointoxication as it arises from the intestine. A woman, fifty-two years old, had been admitted to the hospital under the diagnosis of cerebral syphilis. There were no exanthemata, no swelling of the glands; she had gone through eight

[1] Verhandlungen des XVI. Congress f. innere Med., 1898, p. 187.

births, but had never miscarried. What had excited the suspicion of syphilis was the absence of a uvula, but it was elicited that the uvula had became ulcerated and dropped off after a physician had cauterized a little white spot upon it with nitric acid. The patient was admitted in a comatose condition, with a history that for fourteen days she had vomited everything she had eaten, and for twelve days had had no evacuation of the bowels; consciousness was clouded; she complained of headache, vertigo, and stiffness of the muscles in the back of the neck. The urine contained a large amount of indican and showed the Rosenbach reaction, but contained no acetone or diacetic acid. No tumor nor abnormality could be discovered on palpation. It was necessary to give a small injection of morphine in order to make her retain an Ewald test-breakfast. The test-meal showed free HCl and a total acidity of forty-two. Efforts to evacuate the bowels by high irrigations of water and solutions containing purgative substances were for several days futile. On the tenth day defecation was effected by giving a strong dose of a mixture of croton and castor oil. The fæces were as black as pitch and contained bismuth crystals. The patient asserted that she had not taken bismuth except fourteen days prior to her admission. It was concluded that this bismuth had remained in the intestine almost four weeks. After this evacuation the patient rapidly improved, the bowels moved spontaneously, she had no more attacks of vertigo, etc., and fourteen days later she was discharged cured.

Ewald regards these cases as types of gastric and intestinal autointoxications. I have personally observed such cases, and also patients in whom similar attacks did not occur once only, but the coma, etc., together with the toxic gastro-intestinal symptoms, occurred three or four times in one year. But even in these two typical cases there is no proof offered which compels us to regard them as due to autointoxication, particularly not in the second case, that of the woman with the prolonged obstipation; and as far as the objective demonstration of a toxin in the urine is concerned, Ewald admits that the gold salt of a diamine which he obtained from the urine of similar cases had no toxic effect upon animals. This question of excretion of toxins in the urine brings us to the third means of diagnosis,—

(3) *The Results of Chemical or Microscopical Examination of*

the Secretions and Excretions, Blood, Stomach Contents, Fæces, Urine, Sweat, etc.—It was an assertion of the school of Bouchard that normal urine contained a urotoxin. The amount of urine necessary to kill a guinea-pig when injected into its veins was taken by Bouchard to indicate the degree of toxicity.

Urotoxic Coefficient of Bouchard.—Four factors are taken into consideration to determine this coefficient: (1) the figure expressing in kilos the body weight of the person from whom the twenty-four hours' collection of urine is taken; (2) the (metric) weight of the animal to be experimented upon; (3) the quantity of urine passed in twenty-four hours; (4) the amount of this urine necessary to kill the animal when injected into its veins. The weight (in kilos) of the animal which is killed by a definite amount of urine, calculated to the kilo of body weight of the person from whom the urine is taken, represents the urotoxic coefficient.[1] In healthy human beings the average urotoxic coefficient is 0.465; in diseases it varies from 0.1 to 2.0. The toxicity of the urine is, of course, dependent upon its concentration; but the urotoxic coefficient of Bouchard is a very problematic factor; on account of the difficulty of the technic it is impossible to apply the method clinically, and even in those instances in which it was applied, and by capable clinical chemists, the practical deduction did not justify the amount of labor involved in the test.

In the discussion on intestinal autointoxication during the symposium on this subject at the Sixteenth Congress für innere Medicin,[2] Boas declared that it was wonderful that autointoxications did not manifest themselves during the occlusions and stenoses of the intestinal tract. He considered it remarkable that autointoxication had never been recorded in the large material of intestinal stenoses at the various clinics. This may be partly explained by the fact that in the intestinal obstruction the absorptive function is rapidly paralyzed.[3]

According to the experiments of Gulewitsch, cholin may under certain conditions be transformed into neurin and muscarine in the

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[1] This is supposed to denote the standard toxicity of the urine necessary to kill a kilogramme of living animal.

[2] Loc. cit., p. 201.

[3] Hemmeter, Diseases of the Intestines, vol. ii.

intestinal canal. Cholin may pre-exist in the food, or it may be developed from lecithin, which is contained in eggs. Nesbitt [1] has given the experimental evidence that cholin and neurin may be developed during intestinal occlusion provided the food taken contains lecithin. Neurin may be formed from cholin by the action of bacteria. Among the toxic actions of neurin are a paralysis of the heart and increase of intestinal peristalsis. The practical deduction from these experiments is that eggs should be excluded from the diet in intestinal stenoses and occlusions, and that prior to the surgical operation, which may be necessary, the stomach and as much of the intestine as possible should be cleaned out by lavage. A diagnostic aid is also received from this work, for if neurin and cholin can be found in the intestinal contents, in cases of suspected gradual intestinal stenoses, this should clinch the diagnosis and call for proper treatment.

Although Frerichs has proved the harmlessness of acetone and acetic acid, Penzoldt and von Jaksch were of the opinion that these substances were poisonous when inhaled. The technic of these inhalation experiments has been criticised by Brieger, however.

The most fruitful analyst with regard to the isolation of ptomaines from the urine is Griffiths, according to whom [2] the urine of cases of pleurisy contains a toxin designated by him pleuricin; in eczema he finds eczemin; in carcinoma, carcinin; in epilepsy he finds a specific poisonous base; in angina pectoris, a poisonous leucomaine; in croup, a propylglycocyamine; in scarlatina and influenza he finds poisonous and fever-producing bases. A scientific confirmation of this work is absolutely necessary.

Toxicity of the Sweat.—Arloing found that the injection of from fifteen to twenty-five cubic centimetres of sweat per kilogramme of the animal would cause death. Charin and Mavroyéni observed increased temperature, prostration, hæmaturia, and death occur after the injection of sixty cubic centimetres. But Brieger [3] and Davidsohn found that the injection of sixty cubic centimetres or more of sweat obtained after sweat-baths did not cause the death of a guinea-pig. The latter observers, however, sterilized the sweat, freeing it from bacteria by means of careful filtration, so that the

[1] Jour. Experimental Med., Jan., 1899, vol. iv. p. 1.
[2] Brieger, Verhand. XVI. Congress f. innere Med., p. 179.
[3] Ibid., p. 180.

effects produced by previous experimenters must be attributed to bacteria.

Toxicity of the Blood.—This has been investigated recently by Uhlenhuth.[1] His chief results are the following: (1) Intravenous injection of serum into guinea-pigs does not permit of exact deductions. (2) Subcutaneous injections of blood-serum into guinea-pigs is apparently available for logical deductions. (3) The normal blood-serum of man, sheep, pig, rabbit, even in very small doses (one-half cubic centimetre), when injected hypodermically into guinea-pigs, causes infiltrates, and in large doses necrosis. The injection of twenty cubic centimetres of any of these serums causes death of the guinea-pig. Normal horse-serum produces no infiltrates until a dose of twenty cubic centimetres is reached, when small infiltrates appear which are rapidly absorbed. (4) The blood-serum of four scarlet fever and two typhoid fever patients was toxic in very minute doses. (5) The serum of scarlet fever caused cloudy swelling of the kidneys, with partial fatty metamorphosis, a change which could not be produced by the typhoid fever serum. Whether or not it might be caused by normal blood-serum was not ascertained. These toxins of blood-serum cannot be removed by filtration through a Pasteur filter; they seem to belong to the class of toxalbumins.

Chemical and Physical Properties of Toxins.—From a chemical stand-point the toxins which occur in fæces, urine, sweat, blood, etc., are classified as (*a*) crystallizable, and (*b*) non-crystallizable or amorphous toxins. Frank, Brieger, and Fränkel have designated the latter as toxalbumins. It was at one time thought that these were of an albuminous character.[2] It appears that of the two groups the toxalbumins are the most important; also, that they are not albuminous bodies, but toxins intimately attached to or combined with albuminous bodies. They are poisons which can be separated from the organic albumin of the body only with great difficulty and are very decomposable. These substances are so extremely poisonous that their toxicity surpasses comprehension; still it can be

[1] Zeitschr. f. Hygiene u. Infektionskrankheiten, vol. xxvi. p. 384.

[2] I have repeatedly stated in the course of this article that the chemical and physiological relations of the subject of intestinal autointoxication call for careful and critical testing. The technical difficulties of analyses frequently baffle the most experienced physiological chemist.

demonstrated by experiment. In order to obtain a sufficient quantity for the purpose of weighing them, hundreds of litres of culture-bouillon or hundreds of kilos of human fæces are necessary. These poisons are destroyed by acids, even the weakest, and preserved by alkalies. Curiously enough, these same properties are possessed by the so-called antitoxins. We should, therefore, not conceive of the antagonistic physiological action of toxin and antitoxin, as being comparable to neutralization. The amorphous toxins, or toxalbumins, may in some instances produce the typical clinical picture of the disease in the course of which they are found in the blood. These toxalbumins have in certain conditions of autointoxication, in tetanus, sausage poisoning (botulism), and diphtheria, been isolated from the blood, *and the fact that after isolation they may on being injected into other animals produce the identical clinical picture characteristic of the original disease constitutes the strongest evidence for the theory of autointoxication.*

In studying the effect of the blood-serum of one species of animals upon the organisms of animals of another species, experimenters have attributed toxic phenomena to the serum when the deleterious results observed could with as much justification be attributed to *differences in osmotic tension.* When solutions of different concentrations meet in the circulation of the animal organism, changes occur which at once act detrimentally upon the tissue juices. These changes have been designated *"osmotic tension."* The transference of the blood of a male animal into the circulation of a female of the same species may even cause such phenomena.

The whole subject of the diagnosis of intestinal autointoxication is at present in such a chaotic state, that clinicians with analytical minds will be extremely conservative in making the diagnosis at all. The evidences to be derived from examination of the secretions and excretions, the blood, etc., require such experience in chemical and physiological technic as to be unavailable for clinical purposes. The physical signs may be absent, and the symptomatology so variable that the diagnosis will rarely go beyond a tentative or suggestive one. *In none of the diseases which have been ascribed to intestinal autointoxication are we absolutely compelled by force of logic of all the chemical, pathological, and symptomatological factors entering into the case, to accept the view that the organism has been poisoned from the stomach and intestine. I do not wish*

to deny that this may be and really is the case in many instances; I only wish to emphasize that the uncontrovertible, objective proof of this assumption has as yet not been furnished.

THE RELATION OF THE THYROID GLAND TO AUTOINTOXICATION.

One of the most scholarly and logical researches on this subject is published by F. Blum,[1] who extirpated completely the thyroid gland, including also the accessory thyroid, in two hundred dogs. He thereafter studied the effect of an exclusive milk diet and an exclusive meat diet upon these animals, which, for brevity, I prefer to designate as the "sine-thyroids," by which I mean animals that have been operatively deprived of thyroid glands. The view has for sometime been held that certain poisons are continually circulating in the body, which we may call "entero-toxins," and that these are, as it were, selected, neutralized, and made harmless by the thyroid gland. It is supposed, according to Blum, that this is accomplished by substances formed in the thyroid, and named "thyreo-toxalbumins." There are many evidences which suggest that this gland forms from the constituents of the blood a secretion which acts as an antitoxin towards the toxic products of metabolism and the entero-toxins.[2]

The following deductions are made from the experiments of Blum.

(I.) In animals fed with meat before and after thyroidectomy the mortality is ninety-six per cent., the larger number dying of acute tetany, a smaller number of tetany and consecutive cachexia within from two to twelve days after the operation. Four per cent. of the animals survive the operation without disturbance of the organism, and even later on will tolerate a change in the food, thus proving themselves immune not only against the intoxication resulting from a meat diet, but also against the toxins of other diets.

(II.) The mortality in animals fed exclusively on milk before and after thyroidectomy was only sixty per cent.; of the forty per cent. that survived the operation thirty per cent. could be regarded

[1] "Neue, experimental gefundene Wege zur Erkenntniss und Behandlung von Krankheiten, die durch Auto-Intoxicationen bedingt sind," Virchow's Archiv, vol. clxii. p. 375.

[2] "Die Erkrank. d. Schildrüse, etc.," C. A. Ewald, in Nothnagel's spec. Path. u. Ther., vol. xxii. p. 28.

as permanently healthy, provided the nutrition was carried on by milk only. It is evident, therefore, that a milk diet offers better prospects than a meat diet for the purpose of bringing animals over the after-effects of thyroidectomy.

(III.) "Sine-thyroid" dogs which had remained healthy for a long time after the operation on a milk diet became diseased at once and perished under violent phenomena when fed with meat. If transition to the meat diet was slow and gradual, there were periodical attacks of spasm, progressive cachexia, psychic disturbances, and finally death. It is evident that the immunity acquired by the organism against intoxication under a milk diet does not protect against intoxication under a meat diet. Entero-toxins are formed in the gastro-intestinal tract, under the influence of certain organisms, on a milk diet as well as on a meat diet, but the toxin formation with a meat diet is greater than with a milk diet, and accordingly immunization is less difficult in milk-fed than in meat-fed animals. The larger toxin production during meat diet cannot be attributed to the extractive substances of the meat, for, when "sine-thyroids" that have kept well on milk are given extract of meat, no disturbance of the organism could be observed.

Blum extirpated the thyroid in sucklings of milk-fed and meat-fed animals and in sucklings of a "sine-thyroid" immune mother. All of these animals perished at the age of from four days to six weeks from typical tetany. It is concluded that no immunity towards entero-toxins is present at an early stage of development, and that the transition of protective substances from the mother to the offspring by the milk can be excluded; furthermore, that the thymus gland, which is in full activity from the beginning of life, cannot replace the function of the thyroid.

The blood-serum of permanently immune "sine-thyroid" animals was injected into the circulation of "sine-thyroid" dogs suffering from severe disease phenomena, from ten to one hundred cubic centimetres being injected at a time. The result was that after repeated injections the disease phenomena were ameliorated and eventually disappeared entirely. This justified the conclusion that immunizing substances circulate in the blood of "sine-thyroid" healthy animals.

The toxalbumins which are formed by the cellular activity of the thyroid, according to Blum's conception, are combined with or bound

to the protoplasm of the thyroid ("Gebundenes Gift"). The entero-toxins which are opposed to this thyroid poison are freely circulating in the organism. A number of the experimental dogs of Blum were "naturally immune" to the thyroid toxalbumin, whilst another portion became "actively immune" only after passing through a period of more or less severe disease phenomena.

The removal of the thyroid in animals immune to thyroid toxalbumin resulted in death from tetany in a few days. He concludes that the insensitiveness to the thyroid toxalbumin (or bound poison) is not capable of counterbalancing or weakening the damage done by the free poison or entero-toxin.

Conversely, "sine-thyroid" immune animals showed no insensitiveness to the thyroid toxalbumins, but they died after one hundred and thirteen to sixteen days. This is considered an evidence that entero-toxins and thyreo-toxalbumins do not neutralize or counterbalance each other in their mutual effect. There are certain pathological histological changes which prove an etiological connection between these intoxications and tissue lesions in these experimental animals. Degenerative processes were found in the central nervous system and kidneys.

The main conclusions are the following: If the thyroid can no longer combine with the free entero-toxins, these accumulate in the body and give rise to "sine-thyroid" tetany, myxœdema, cretinism, etc.; and, as shown by the above experiments, other affections of the central nervous system also, with periodical spasms and certain forms of degenerative kidney changes may be caused by these poisons, which under normal conditions would be picked out and removed by the thyroid.

If the ability of the thyroid to bind the freely circulating toxins is still preserved, but if the bound thyroid toxalbumins escape from the gland before they are made harmless, they enter the circulation and exert a detrimental effect on the organism. This disturbance in function of the thyroid probably corresponds to the condition known as thyroidism and also to Basedow's disease (exophthalmic goitre). The recommendation of a milk diet in the treatment of thyroidism and exophthalmic goitre receives a further support from these experiments.

TREATMENT.

In some instances the practitioner may decide, after careful consideration of the case, that a process of self-poisoning from the

gastro-intestinal tract is a complicating factor. If the treatment instituted to prevent the flooding of the system with toxins results in improvement, it is usually taken as a confirmation of the tentative diagnosis of autointoxication. This is not always a logical deduction, for relief may follow when the symptoms were due not to self-poisoning but to reflexes. The prompt improvement following thorough evacuation of the intestinal canal after obstipation does not prove satisfactorily that self-poisoning had existed; the symptoms may have been reflexes.

The old *theory of the reflexes,* of course, is not applicable in explanation of such conditions as diabetic coma, uræmia, carcinomatous coma, etc., but it may explain such states as gastric and intestinal vertigo and dyspeptic asthma. The vertigo and pallor of the face which occurred immediately after the stomach of Alexis St. Martin was touched by Beaumont with a thermometer afforded a time-honored physiological evidence of what a reflex from the stomach may produce. The so-called "*dyspeptic asthma,*" which is in the main a cardiac dyspnœa, has been described as occurring in association with overloading of the stomach with indigestible food. I have observed three cases of this condition. They occurred so promptly after a meal that there could be no possibility of decomposition of the ingesta. The symptoms ceased as soon as vomiting had emptied the stomach of its contents, which upon analysis were not found decomposed. It is, therefore, improbable that an autointoxication could be at the bottom of dyspeptic asthma; it is much more likely to be due to a reflex. An interesting polemic has taken place between Katz,[1] Albu,[2] and Müller,[3] as to how far the old reflex theory will suffice in explaining phenomena that are claimed to be due to autointoxication. Katz maintains that the reflex will explain the majority of these symptoms, Albu will give very little room to the old theory, rather favoring the modern view of intestinal autointoxication, while Müller occupies an intermediate position. The discussion has, however, not been very productive in clearing up the subject, as Albu himself finally admits, "It still remains the work

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[1] Wiener med. Presse, July 9, vol. xxxiv. p. 1094.
[2] Autointoxicationen, loc. cit., p. 200.
[3] Verhandl. d. XVI. Congress f. innere Med., p. 168.

of the future to sift out those cases in which the reflex and those in which the autointoxication is the cause of the disease." [1]

The methods of treatment may be arranged according to their importance as follows: (1) The diet; (2) lavage of the stomach, of the colon and rectum, and enteroclysis; (3) treatment by medicines, purges, and emetics; (4) intestinal antiseptics; (5) specific medication (brewers' yeast, menthol, ichthyol, hydrochloric acid, calomel, etc.); (6) methods directed to increasing elimination by the skin and (7) by the kidneys; (8) elimination of toxins by the infusion of normal salt solution; (9) venesection.

(1) *Diet.*—In the following the usefulness of the various means of treatment will be considered independently of any theory attempting an explanation of their action. We often know what relieves certain symptoms of self-poisoning, and yet we do not know how the agent acts. In this condition, more than in any other disease to which the human frame is subject, individualization is most important. It is this individualization which distinguishes the trained physician from the "quack," even in the eyes of the laity; for the "quack" is a routinist, who does not deviate from his cast-iron scheme, but attempts to apply his stereotyped practice to all patients alike, while the trained physician is a man with an analytical mind, who treats the patient and not the disease, who treats the individual whilst at the same time he has an eye to the underlying pathogenic factors.

[1] This entire polemic reminds me of an amusing verse which I found in an old German medical treatise:

"Der Erste hat ein Haar gespalten
Und einen Vortrag darüber gehalten,
Der Zweite fügt es wieder zusammen
Und muss die Ansicht des Ersten verdammen;
Im Buch des Dritten ist zu lesen,
Es sei nicht das richtige Haar gewesen,"—

which in English would read about as follows:

The first one had split a hair
And lectured on it everywhere;
The second put it together again
And swore the work of the first was in vain;
In the book of the third you may read
That it was not the right hair indeed.

Temporary Total Abstention from Food.—In the acute gastro-intestinal autointoxications a patient who takes no food is not really starving; he is only for the time being living on his own fat stored up in the body and on the glycogen stored up in the liver. There is an "interstitial digestion," as Claude Bernard calls it, in which no toxins are generated. By cutting off the food from the digestive tract we may starve out the microscopic demons that are setting up a revolution in the intestines. In acute intoxications Nature herself points out the expediency of total abstention from eating, for the patients have rather a disgust than an appetite for food and refuse to partake of any nourishment. But in chronic autointoxications the conditions are different; here a carefully selected diet and one adapted to the individuality of the case is necessary.

Diet for Chronic Autointoxication.—There can be no doubt that a patient may derive decided benefit from methodical control of the diet. This has been shown by Escherich in the intestinal autointoxications of children. In a general way it may be said that in these conditions, at least, the putrefaction of proteids or albuminous food becomes arrested by a predominating fermentation of the carbohydrates, also that the processes of decomposition are dependent upon the character of the food. For instance, a so-called acid dyspepsia dependent upon fermentation of milk may be arrested by exclusively dieting with albumen; again, an albumin putrefaction can be checked by a diet of farinaceous food. Above all things, it is necessary to find out the particular article of diet which is undergoing decomposition. This may be discovered by a careful study of the fæces, particularly with the aid of the Boas stool sieve.[1] The article of diet which is indigestible will, as a rule, be caught upon the sieve, and can easily be recognized.

In this connection a study of the personal diet idiosyncrasies is of great interest. Some persons cannot eat strawberries without suffering from intense urticaria, others will have intestinal autointoxication from eating crabs, fish, or eggs, too much sugar, etc.

The Abdominal Brain.—While speaking of the diet idiosyncrasies, I cannot resist narrating an opinion of the celebrated Leipsic physiologist, Ludwig. A certain article of diet was forbidden to him during an attack of sickness, whereupon he answered, "That

[1] Hemmeter's Diseases of the Intestines, vol. i.

food I will digest perfectly well; the intestine has its own brain, it functions differently in different people; just as the cerebrum disposes and qualifies one man to become a merchant and another man to become an artist, similarly my intestinal brain is so adjusted that I can digest cranberries and cucumbers, whilst another person's intestines cannot." This characteristic of the abdominal or intestinal brain, as Ludwig called it, enables us to understand why some people have idiosyncrasies to certain articles of diet. It happens sometimes that an adult may digest a particular food perfectly until one day, by an exceptional coincidence of circumstances, such as mental and physical overwork, nervous excitement, and "catching cold," he is in such a condition that this food will give rise to toxic phenomena. Curiously enough, this diet substance may from now on act as a poison for many years, perhaps for life. Some change has occurred in the abdominal brain whereby it will always remember that mischievous article and begin to resent its admission to the organism as soon as it reaches the digestive tract.

Fatal Effects of Certain Diet Combinations in Animals.—This subject has a certain experimental basis which will serve to impress upon the general practitioner the great importance of individualization in diet, for it would, no doubt, interest him to know that in certain animals death can be caused by definite combinations of food. For example, it is well known that rabbits can digest grape sugar perfectly well. An ordinary rabbit may tolerate from fifty to sixty grammes of glucose and only traces of it appear in the urine. The remaining diet, during this glucose feeding, must consist of green vegetables,—carrots or turnips. If after this period the animals are put upon a diet of oats, during which the urine becomes very acid, and are then given glucose, they will become weak in a few minutes after this form of sugar is taken and will die within a few hours. Cane sugar and levulose will have the same effect; but milk sugar, in addition to feeding with oats, will produce no such toxic results. Here is an instance of death caused by an exceptional combination of otherwise harmless dietetic articles. When these rabbits were given calcium carbonate with the oats, the toxic phenomena did not appear. That a combination of glucose and oats is not fatal to all herbivorous animals requires no confirmation. I have frequently fed my saddle-horse with dextrose after he had eaten a hearty meal of oats, and he seemed to thrive upon the com-

bination. These experiments with rabbits are valuable simply in suggesting the peculiar and the different construction and functioning of the digestive organs in these rodents.

There are three ways of ascertaining by laboratory methods whether any particular food has an influence in reducing autointoxication. The first is the determination of the ethereal sulphates in the urine; the second is the determination of the number of bacteria in a weighed amount of the fæces; the third is the fermentation of the fæces in graduated fermentation tubes, as originally practised by Adolph Schmidt.[1] Unfortunately, none of these methods is exact. The determination of the ethereal sulphates involves laborious analyses, and the normal variations in the quantity of the preformed and conjugate sulphates are so great that deductions from such analyses should be made with great conservatism. The counting of the bacteria in weighed amounts of fæces is also a very time-robbing and variable method, and the practical deductions therefrom hardly justify the amount of work involved. The fermentation of the fæces,[2] if it gives positive reactions,—that is, if the fermentation tube is filled during the first twenty-four hours, when there are no other symptoms of intestinal disturbance, —in my experience signifies that the carbohydrates are not digested perfectly. There is an early and a late fermentation. The late fermentation begins on the second or third day, and forms gases consisting largely of marsh gas and hydrogen sulphide, whereas the early fermentation produces seventy-five per cent. of carbon dioxide and comparatively little hydrogen sulphide and marsh gas. This method of Schmidt has been much criticised by Basch and Kersbergen; nevertheless, in my opinion, if it be consistently practised after the ingestion of exactly known foods, it is of a certain utility in determining the degree of starch indigestion. After a diet consisting of a quart of milk, four eggs, three pieces of toast, a plate of oatmeal soup, and a plate of flour soup, one cup of bouillon, and one hundred and twenty grammes of potato, there should normally be no fermentation in the first twenty-four hours. If it does occur, it shows that there is an imperfect digestion of the starches. This can, it is true, be much more rapidly found out by microscopic and macroscopic examination of the fæces.

[1] Die Faeces des Menschen in normalen und krankhaften Zuständen, I. Theil.

[2] Hemmeter's Diseases of the Intestines, vol. i. p. 248.

In cases where milk has formerly been well digested, it constitutes the dietetic antiseptic *par excellence*. In cities and in the country Pasteurized milk should be preferred in all cases. This is milk which has been sufficiently heated to destroy the possible infectious bacteria,—the tubercle, typhoid, diphtheria, cholera, and influenza bacilli. Sterilized milk has been subjected to a much higher degree of heat for three successive periods, the temperature being raised to 110° or 115° C. Unfortunately, such milk, while it may be absolutely free from bacteria, is decidedly more difficult to digest than that which has been only Pasteurized or that which has not been boiled at all. According to Müller,[1] it has recently been asserted that rhachitis is the result of excessively sterilized diet for children. This does not harmonize with the theory of Combi, who holds that the disease is a consequence of intestinal autointoxication. It should not be difficult in the larger cities to obtain milk which is practically so free from bacteria that very slight Pasteurization will suffice to render it a safe and useful article of diet in intestinal autointoxication. Rennin or chymosin, the milk-curdling ferment of the human stomach, will curdle raw milk seven or eight times as rapidly as it will sterilized milk, and raw milk is much more easily digested and absorbed than even Pasteurized milk.

(2) *Lavage of the Stomach, of the Colon and Rectum, and Enteroclysis.*—The only genuine intestinal antiseptic is evacuation of the digestive tract. Many times the patient himself will have made the first efforts to accomplish this result. But where vomiting and purging have not yet taken place, or where they have been kept up an unduly long time, lavage of the stomach and of the colon should be at once undertaken. Enteroclysis, which means the attempt to force water through the entire large and small intestine, even if it were possible, is not necessary, because a thorough clearing out of the colon and stomach by irrigation has proved sufficient. This gastric and colic lavage is the one therapeutic measure concerning the utility of which there are no dissenting opinions.

(3) *Treatment by Purges and Emetics.*—Where lavage of the stomach and colon is practised, emetics and purges are unnecessary,

[1] Verhandl. d. XVI. Congress f. innere Med., page 168.

but if instruments are not at hand for washing out the digestive tract, such drugs may be used. The most practical emetic is the following:

℞ Powdered ipecac, gr. 20;
Antimony and potassium tartrate, gr. ½.
Take at once.

Apomorphine hydrochlorate, in doses of one-twelfth of a grain hypodermically, is too depressive to use in the majority of cases of autointoxication. Personally I have never been compelled to resort to it. The best purges are calomel and castor oil; it is hardly necessary to specify their mode of administration.

(4) *Intestinal Antiseptics.*—The human intestine is provided with a natural means of disinfection, which is often injured by the very agents that we use to destroy the intestinal bacteria. A similar natural protective provision against bacterial infection exists in the vagina, and obstetricians have recognized that this provision may be injured by antiseptic vaginal irrigations. R. Schütz [1] has studied this natural means of defence against bacteria by administering counted numbers of the *Vibrio Metchnikoffi,* and has discovered that, whilst the intestine will get rid of an enormous number of these organisms unaided, they will appear in the fæces abundantly if the normal peristalsis is interfered with by drugs. Even after the administration of calomel the vibrio of Metchnikoff appeared in larger numbers than when no drug was given. This normal defence against bacterial aggression is much more developed in the lower mammals, the dog for instance, which may explain the observation that intestinal autointoxications are unknown in animals.[2] Not only may antiseptics do harm by destroying this intrinsic protection of the intestine, but their toxic properties may reduce the resistance and the healing tendency of the living cells.

Only those intestinal antiseptics should be considered which are not soluble and cannot be absorbed from the upper part of the digestive tract, and therefore stand some chance of reaching the lower intestinal districts where the putrefaction is most intense. For this purpose the following substances have been used: Deriva-

[1] Berliner klin. Wchnschr., June 18, 1900, vol. xxxvii. p. 553.
[2] Fröhner, Veterinary Academy of Berlin.

tives of formaldehyde, calomel, menthol, enterocresol, xeroform, iodoform, naphtalin, naphtol, turpentine, bismuth compounds, preparations of salicylic acid, salol, tannin, beta-naphtol, etc. R. Stern [1] has studied the effect of a number of these substances, particularly calomel, salol, and beta-naphtol, upon known quantities of cultures of *Bacillus prodigiosus,* which were introduced into the intestinal canal of animals. He found that the fæces contained an abundance of these bacteria during the time that the antiseptics were used. I do not wish to characterize attempts at intestinal antisepsis by these drugs as useless, for, after all, it is not the destruction of bacteria which should be aimed at, but simply their innocuousness. If we can weaken them sufficiently to prevent them from exerting their deleterious effects, autointoxication will not occur. The evidences that certain medications really do benefit the patient, even though there may be no evidences to this effect in the urine and stools, will be given in the next paragraph on specific medication. I had a personal experience which confirms this view. Following an attack of obstipation I suffered from rheumatism in the left arm and from headache. Ten grains of beta-naphtol and ten grains of salicylate of bismuth were taken three times a day for a week, together with oil enemata. The amount of ethereal sulphates in the urine did not decrease nor was there any diminution in the number of bacteria in a weighed amount of fecal matter, but the symptoms all disappeared and I recovered on the sixth day and returned to my ordinary diet.

(5) *Special or Specific Medication.*—There are certain remedies which seem to exert a special influence on special intestinal fermentation and putrefaction. Quincke [2] claims to have observed great improvement in certain diarrhœas and intestinal dyspepsias under the administration of brewer's yeast in pure culture, and Ageron [3] asserted that Berlin *Weissbier,* which contains large amounts of brewer's yeast, was very beneficial in cases of cholera that occurred in Hamburg. Brewer's yeast, a complex growth of bacteria and fungi, has for some time been known to exert a beneficial effect in furunculosis, and it is supposed to act upon the principle of destroying one bacterium by another. Rosenheim observed

[1] Verhandlungen d. XVI. Congress f. innere Medicin, p. 199.
[2] Ibid., p. 193.
[3] Ibid., p. 195.

an improved starch digestion in obstipation by use of this yeast. This "*driving out of the devil by Beelzebub*" is a questionable proceeding, and particularly in cases of advanced prostration and diarrhœa should not be employed. Another dietetic way of accomplishing this object is to eat small quantities of Neufchâtel or Swiss cheese. It is possible that the bacteria contained in cheese are the pharmacological basis.[1]

The other special medicaments with which I have had experience are menthol and ichthyol, in urticaria from eating strawberries and indigestion after partaking of crabs or fish, hydrochloric acid in cases of achylia gastrica and wherever the gastric analysis shows the absence of free HCl, salicylic acid, in doses of eight grains largely diluted, in gastric dilatation with much distention and flatulence, and calomel for obese patients with enlarged liver. All these remedies are of decided utility when given for these special indications.

(6) *Methods directed to increasing Elimination by the Skin.*—These are not always necessary, but, if a patient taken with acute autointoxication is known to have uric acid diathesis or to have suffered previously from renal insufficiency, or if the attack has come on after chilling of the surface, a sweating bath will in many cases be of benefit. Sweating should not be effected by internal medication, except perhaps by hot teas, but rather by hot baths and warm external applications.

(7) *Efforts to increase Elimination by the Kidneys.*—In all cases of supposed autointoxication it is indispensable that the urine passed during twenty-four hours should be measured, in order to gain an adequate knowledge of its amount. I find that in nearly all genuine autointoxications the total amount of urine passed in twenty-four hours is, as a rule, very much reduced during the period of intoxication. If, however, the urine be measured imme-

[1] Shakspeare was sensible to the attributes of cheese in the process of digestion, and alludes humorously to it in "Troilus and Cressida" (Act ii., Scene 3), when he makes one of his characters exclaim, "Where, where?—Art thou come? Why, my cheese, my digestion, why hast thou not served thyself in to my table so many meals?" Brewer's yeast has recently been placed upon the market in pure culture, and a French house has made an extract of it under the name of "levurine." Brewer's yeast as such is a most disgusting substance, and will hardly be taken by refined patients, whereas they would possibly not object to eating Neufchâtel cheese and drinking *Weissbier*.

diately after the symptoms of self-poisoning have improved, an increase above the normal is occasionally found; thus, the total quantity may be from eighteen hundred to two thousand cubic centimetres in twenty-four hours. This is to be looked upon as a reaction after the diminished secretion during the intoxication.

Renal Insufficiency in Autointoxication.—I have frequently observed that, while the amount of urine passed in twenty-four hours sinks to a minimum, at the same time the ratio of solid substances contained in this small amount is almost below the normal. Boas[1] mentions a lady whose total excretion of urine in twenty-four hours was only from three hundred to four hundred cubic centimetres, and this had a very low specific gravity. All efforts to increase the amount of urine by abundant drinking of water and large enemata were futile. I believe that much practical information may be gained simply by measuring the urine of such patients and determining its specific gravity.

Determination of the Amount of Solids in the Urine by Means of the Urinometer.—If the last two decimals of the specific gravity of the urine be multiplied by 2.33, the product indicates in grammes the quantity of solid substances contained in one thousand cubic centimetres of that sample. For the sake of brevity and clearness I will multiply by two instead of 2.33. Suppose a patient has passed fifteen hundred cubic centimetres of urine in twenty-four hours and its specific gravity is 1015; multiplying the last two figures by two, we get thirty, the number of grammes of solid substance in one thousand cubic centimetres of the urine; therefore there are fifteen grammes in five hundred cubic centimetres and forty-five grammes in fifteen hundred cubic centimetres, the total quantity passed. It has been shown that about one-half of the urinary solids is made up of urea and one-fourth of chloride of sodium. Now, as we have forty-five grammes of solid substances, one-half is 22.5 grammes, which represents the amount of urea; and one-fourth is 11.25 grammes, representing the amount of chloride of sodium, and the balance, 11.25 grammes, would cover the remaining solid constituents. The figures obtained by multiplying with 2.33 are not absolutely correct, but I have found, from a large number of quantitative analyses of the solid substances of

[1] Verhandlungen d. XVI. Congress f. innere Medicin, p. 202.

the urine, that they are sufficiently approximate to afford some useful conception of the amount of solids in physiological urine. When albumin and sugar are present in the urine, this way of determining the solid constituents by the specific gravity is fallacious. But even then it is not without some value as a quick method of determining approximately the total urinary solids. We must have regard for methods available to the general practitioner (who, as a rule, is not a chemist), even if they are not exact.

In order to increase the urinary secretion when it is suppressed, the mild diuretics should be tried first. Potassium and sodium tartrate and bicarbonate may be given in doses of from ten to twenty grains. If there be decided enfeeblement of cardiac action, infusion of digitalis with acetate of potassium and tincture of nux vomica are advisable. Calomel is a good diuretic, and caffeine together with strychnine has also a sphere of usefulness in these conditions. Diuretin is an available remedy. But no one would be justified in using any of these drugs without having determined beforehand, by measurement and ascertaining the total solids through the specific gravity, that renal insufficiency actually exists.

(8) *Elimination of Toxins by Infusion of Normal Salt Solutions.*—There is no more prompt and rapid means of increasing the amount of urine than the subcutaneous infusion of sterile normal salt solutions. It is particularly valuable in those acute intoxications where the circulation is depressed and the arterial pressure reduced. In the intensely acute intoxications which occur in the infectious fevers these infusions are of undoubted value, according to my experience. I believe that life was saved by this procedure in two cases of very severe autointoxication occurring in the course of typhoid fever. For flushing out toxins there is no more prompt or effective method than this, which cannot be replaced by the drinking of water or by injecting it into the intestines, for oftentimes vomiting and purging are present, and, even if they are not, the gastro-intestinal tract may refuse to retain such considerable quantities of water.

(9) *Venesection (Bloodletting).*—There is no doubt that even this heroic method has its sphere of utility in cases where the circulation is loaded with toxic substances, especially in plethoric subjects, with high arterial tension. In one case of severe autointoxica-

tion due to compression of the intestines by adhesions emanating from the gall-bladder (as proved by subsequent operation) the patient was brought to the city from the country in an unconscious condition. The practitioner in charge stated that the unconsciousness had developed so suddenly that cerebral hemorrhage and apoplexy were suspected. He urged venesection, because it had restored the patient to consciousness on a previous occasion. About a pint and a half of blood were drawn by the practitioner in charge, and four hours later I found the patient in full possession of his mental faculties. It was then possible to obtain his previous history, which pointed to cholelithiasis and obstruction. An operation completely relieved him. But the effect of the bloodletting was so manifest that personally I was convinced that the restoration of consciousness was due to elimination of poisons thereby.

In conclusion, I desire to repeat that intestinal autointoxications are most effectively treated by prophylactic measures, diet, evacuation of the gastro-intestinal canal, rest, and restoring the digestive tract to normal functioning after an exact diagnosis has been made. It has been suggested that this form of intoxication, like exogenous poisoning, might be treated by antitoxins or antidotes. It is not impossible that we may in future come into possession of antitoxins effective also against the poisons originating within the body, but in order to accomplish this we must first isolate these toxins and study them outside of the organism. So far the idea of the antitoxic treatment of the autointoxications is nothing more than a hopeful suggestion.

Surgery

RESECTION OF THE CERVICAL SYMPATHETIC.

SPECIAL ARTICLE.

BY PROFESSOR THOMAS JONNESCO,

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The cervical sympathetic was long considered one of the structures that were beyond the domain of practical surgery. Physiological observations seemed to show that the cervical ganglia fulfilled a definite set of important functions that put the possibility of their extirpation entirely out of the question because of certain vasomotor and trophic changes which would inevitably follow their removal. The classical experiments on animals by which the first hint of the direct influence of the sympathetic nervous system over the capillary blood-vessels was obtained had been made by section of the cervical sympathetic. Its influence on the pupil is well known, and in animals its section was often followed by trophic changes in the eye which led to the almost inevitable development of pathological conditions in that important organ.

It is easy to understand, then, why the cervical sympathetic was a *noli me tangere* to modern surgeons. We are at the present time, however, in a position to set aside entirely the nightmare of possible trophic or circulatory disturbances caused by section of the cervical sympathetic. During the last five years I have performed over one hundred and thirty bilateral cervical sympathectomies. This means that in a certain number of cases I have extirpated the entire cervical sympathetic on both sides,—that is, all three of the cervical ganglia,—and in others have removed portions of this chain of ganglia. My smallest exsection of the sympathetic involved the removal of the superior ganglion. In two cases I removed without hesitation even the first thoracic ganglion, exsection of which in

the living subject has been declared to be anatomically impossible. I may say at once that in none of these cases has there been the slightest sign of trophic or circulatory disturbance. The flushing of the face that on theoretic grounds should occur (illustrated by the increased amount of blood in the rabbit's ear after the classical experiments) has not occurred, or has been only a passing incident, the result of the irritation of the nerves at the time of the operation. Subsequently circulation in the head has been perfectly normal: there have been no signs of trophic disturbance either in the eye or in any of the facial tissues.

Surgeons are perfectly free, then, if they find indications for the operation, to perform a resection of the cervical sympathetic without any fear of serious postoperative sequelæ from interruption of supposed physiological functions of the nerve. Of the patients on whom I have operated about one hundred were epileptic, fifteen were suffering from exophthalmic goitre, twelve had had symptoms of glaucoma, and two were cases of essential migraine.

The favorable results obtained in my experience with resection of the cervical sympathetic are not unique in surgical literature. Other operators have found that cervical sympathectomy can be performed without either the immediate or the remote dangers that had been anticipated because of the conclusions drawn from experimental physiology. Professor Chipault, of Paris, reported, at the last International Medical Congress at Paris, that he had done resection of the cervical sympathetic altogether some forty times. He found it a delicate and difficult operation, but not an extremely dangerous one. With regard to the trophic disturbances that were said to be sure to follow, especially in young subjects, he saw nothing of them, and concluded that they were mere illusions of the physiologists who applied too widely to man what they had seen occur in animals.

For epilepsy Dr. Chipault operated some twenty-five times, with three complete successes. In these three cases patients who had had two or three epileptic attacks a day for a good while have had none for several years since the operation. Hence Dr. Chipault concludes that sympathectomy is of real benefit in certain cases of epilepsy, though these cases are rare. In exophthalmic goitre he operated twice, with excellent results in both cases. In glaucoma he has operated seven times, once with complete success and several

times with very gratifying results, especially as regards the effect produced upon the pain, which ceased immediately and definitely. An almost equally good effect upon vision was also noted. One of his patients, who had suffered from a fulminant form of the disease called double hemorrhagic glaucoma, was able after the operation to take up once more his occupation as a student of law. Dr. Chipault has also found resection of the cervical sympathetic useful in ophthalmic migraine, in spasmodic torticollis, and in three cases of facial neuralgia. In a very severe case of acne rosacea cervical sympathectomy produced an immediate and lasting cure. Professor Chipault did not hesitate to say that the surgical importance and therapeutic application of resection of the cervical sympathetic seem sure to increase, and that there are a number of chronic conditions about the face and head in which the underlying factor is some chronic disturbance of the superficial circulation that will be benefited by cervical sympathectomy.

Up to the time of the International Congress at Moscow in August, 1897, I had operated upon twenty-nine epileptics, of whom twelve were cured and four greatly improved. This constitutes an excellent therapeutic result, considering that epilepsy is commonly so hopelessly obstinate to treatment. Patients who have not been cured nor improved by the cervical sympathectomy are in no worse condition than they were before. Besides, in this matter of epilepsy success or failure cannot be definitely spoken of during the period immediately following the operation: lapse of time may modify the results very materially. It seems that often during the time in which the epileptic attacks have occurred the organism has formed an explosive habit, which causes them to continue even after the lesion to which they were due has been removed or the nervous mechanism on which they depend has been altered by operation. In the course of time, however, especially after properly directed operative measures, something of this habit may be overcome, and then the nervous organism will resume its normal stability. We may look for improvement later on in some of the cases of cervical sympathectomy, even where immediately after the operation there seemed to be no favorable modification of the epileptic condition.

In general the results obtained by the operation since that time have been extremely satisfactory. I have operated on altogether

over one hundred epileptics. Thirteen of these operations were done in 1896. Three of the patients were completely cured and have had no epileptic seizures for five years. One was distinctly improved, the attacks being very much lessened in number and severity, so that, while before a regular occupation was almost impossible, now life has become livable and the wage-earning capacity has practically been restored. Four of the operations were unsuccessful. Five of those operated upon have died since the operation, though not as the result, either immediate or remote, of the removal of the cervical sympathetic. In 1897 I operated on seventeen patients. Six of them were completely cured, two were greatly benefited, five were not helped, though no bad subsequent results were noticed, and in four of the cases the present condition is unknown, the patients having passed from observation. In 1898 I operated upon nineteen patients; three were absolutely cured, one was very materially improved, and five were left with symptoms unchanged by the operation. Of ten of these patients the present condition is unknown. I have since operated on about fifty cases. I do not regard any of the results obtained as definitive until at least two years have passed. I make no mention at all for the present of cases operated on more recently.

I have performed cervical sympathectomy upon fifteen patients suffering with exophthalmic goitre. Two of the operations were done in 1896, three in 1897, five in 1898, two in 1899, and three in 1900. All the patients were either completely cured or very much improved. When I speak of cure, I mean that the general condition was so modified that nutrition became normal and the nervous condition was restored to its original stability. Besides this the three cardinal symptoms of the disease—the prominent eyeballs, the enlargement of the thyroid gland, and the persistent tachycardia—disappeared completely. All the patients had suffered, as is usual in exophthalmic goitre, with digestive symptoms. These consisted in either persistent diarrhœa or alternating periods of constipation and diarrhœa. These symptoms also were completely relieved by the resection of the cervical sympathetics, and this amelioration of digestive trouble seemed to constitute the basis for the improvement of nutrition and general health that followed. Of the ten cases that were operated on three years ago or more six are completely cured; the other four still present certain symptoms

FIG. 1.—Unmarried woman, twenty years of age; she had suffered from Basedow's disease for over a year. Exophthalmos was most marked on the right side; there was constant lachrymation from both eyes, and the patient was restless and inclined to insomnia.

FIG. 2.—The patient shown in Fig. 1, four weeks after complete sympathectomy. Exophthalmos had almost entirely disappeared, tachycardia was absent, the sleep was normal, and the nervous restlessness allayed. A year after the operation there was no recurrence of any of the symptoms.

FIG. 3.—Unmarried woman, twenty-one years of age. She had suffered from Basedow's disease for one year and four months. There were exophthalmos and distinct tremor.

FIG. 4.—The patient shown in Fig. 3, three weeks after the complete removal of the cervical sympathetic on both sides. There has been no recurrence of exophthalmos or tremor.

of what may be called secondary Basedowism or abortive forms of the disease; while not completely cured, they have been very much improved.

While resection of the cervical sympathetic has accomplished much for epilepsy and exophthalmic goitre, there still remains another very serious condition for which it promises to be even more effective as a therapeutic measure, though the disease to which I refer is usually extremely obstinate to treatment. Some of the most perplexing problems in modern surgery are presented by severe cases of glaucoma. One of the most trying positions that a surgeon can occupy is the direction of a case in which he cannot be sure whether his patient may not suffer the loss of his sight in spite of every possible surgical procedure. A promising addition to our surgical armamentarium for the treatment of this disease would be most welcome, and it seems to be offered by the operation for the resection of the cervical sympathetic.

It is now about four years since I performed the first cervical sympathectomy for glaucoma and announced to the world that it had given a satisfactory result. During that period the operation has been performed by a number of others, some of them in widely distant places. This extensive test of the operation is sufficient to prove that the theory was a good one and its results encouraging. I have been able to collect about thirty-five reported operations for glaucoma, twelve of which I performed myself. All of the operations, excepting those in my own practice, were done under the direction of eye specialists. This fact is an evidence of the want of confidence that ophthalmologists have in ordinary ocular operations when certain forms of glaucoma are in question. It also shows the confidence that specialists have accorded to the new operation which I introduced.

Of the twenty-two cases reported from different countries I find that in twenty the operations were followed by distinct and lasting improvement. Failures were reported in two instances only. I performed five operations in 1897, two in 1898, two in 1899, and three in 1900.

Of my five sympathectomies in 1897, two failed to produce immediate beneficial results; and as I was not able to learn the subsequent history of the patients, I am not sure of the eventual conditions. In one of the cases the immediate result was excellent;

but, as the patient passed from my observation, I do not know his present condition. The two remaining cases were greatly improved, and their good condition has continued during the four years that have elapsed since the operations were performed. One of the patients was suffering from simple chronic irritative glaucoma, the other from simple chronic glaucoma. Both of these patients had been previously subjected to double iridectomy, without any favorable change in their symptoms.

Of the two patients operated upon in 1898, one, suffering from acute glaucoma, was not benefited by the cervical sympathectomy. The other presented an extremely interesting case of double chronic glaucoma. Iridectomy had been done in both eyes without relieving the patient in the slightest. One optic nerve was completely atrophied; the papilla showed this very distinctly. In the other eye there was a very small amount of vision. The resection of the sympathetic produced an excellent result in this almost blind eye, and vision has since continued to increase. At the present moment the patient is able to see rather satisfactorily, and is therefore in a position to follow his occupation quite well.

Of the two patients operated upon in 1899, one was affected by simple chronic glaucoma. Iridectomy was done, but, as so often happens, without a satisfactory result. The patient was, however, very much improved by bilateral resection of the sympathetic. The other patient suffered from a glaucomatous cataract on one side, with complete loss of all perception of light; in the other eye there was a chronic irritative glaucoma that had begun to progress quite rapidly and was causing very serious symptoms. Iridectomy was tried, but it failed completely to limit the glaucomatous process or to give the patient any comfort. Resection of the sympathetic on this side led at once to noticeable improvement in the patient's symptoms and stopped the further progress of the disease. The acuity of vision that existed at the time of the operation has not diminished since the performance of the cervical sympathectomy.

Of the three patients operated on in 1900, all were suffering from double irritative chronic glaucoma. In the first case iridectomy was done on one side and resection of the sympathetic on the other side. The immediate result was excellent, and in two months after the operation the acuity of vision had considerably increased. The second case was one of double acute glaucoma. Iridectomy

FIG. 5.—Unmarried woman, twenty-seven years of age. She had suffered from Basedow's disease for over three years; there were marked exophthalmos, severe tachycardia, and tremor. She was restless and inclined to be sleepless.

FIG. 6.—The patient shown in Fig. 5, after the complete removal of the cervical sympathetic on both sides, the operations being a week apart. The exophthalmos is much improved, tachycardia and tremor have not returned, and there is no restlessness and insomnia.

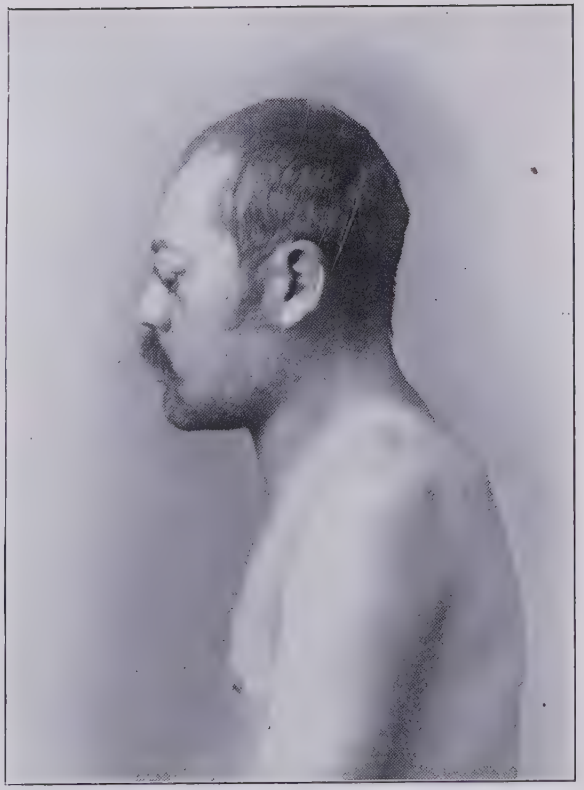

FIG. 7.—Man suffering from Basedow's disease for over two years, with marked exophthalmos, greater on left side. The left eyeball seems nearly dislocated from its socket; the vision in the left eye is practically *nil*, and in the other but slight. The cornea is cloudy from exposure and irritation. He has hot feelings in his head that make him restless.

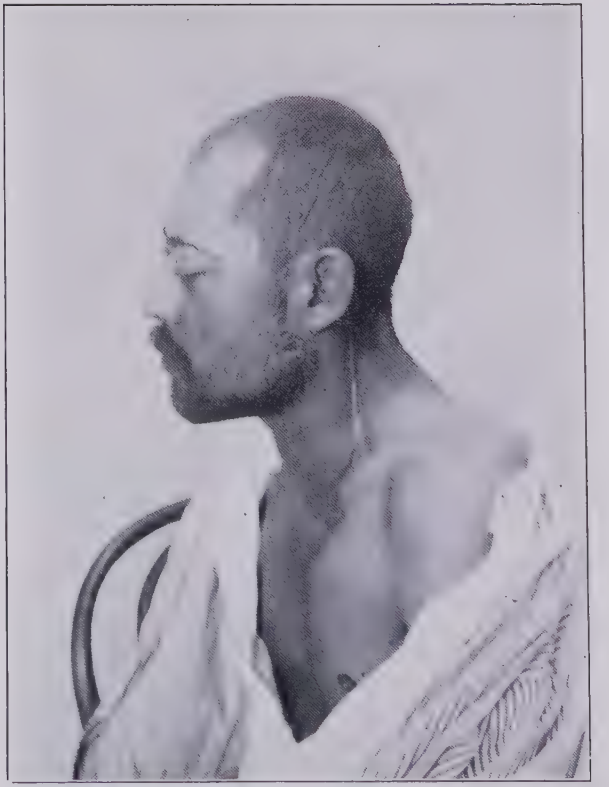

FIG. 8.—The patient shown in Fig. 7, after double cervical sympathectomy. The lids now cover the left eye completely. The conjunctival and corneal conditions have improved, and his vision is now such that he can find his way around by himself. His goitre is also lessened.

was done on both sides without benefit. Bilateral resection of the sympathetic was then performed, and the vision has since remained *in statu quo,* but there has been distinct diminution of the intra-ocular tension. The third case was one of double glaucoma with an acute inception, a remission of the symptoms, and then a succession of exacerbations. Bilateral resection of the sympathetic was done, since which there has been no further exacerbation. The pains have ceased completely, the intra-ocular tension has diminished, the acuity of vision that existed at the moment of the sympathectomy has been maintained, and there has been no tendency to relapse.

The immediate as well as the ultimate results of cervical sympathectomy in glaucoma are very satisfactory. Complete restoration of vision in such cases cannot be expected. As is well known, the continuance of high intra-ocular tension will result in the destruction of some of the delicate tissues that go to make up the external organs of vision. When these are destroyed it is impossible to restore vision without absolute re-creation. We have reason to expect improvement and relief from pain in these cases, however, and to feel that even the maintenance of the limited amount of vision that existed at the moment of operation is of the greatest advantage. Chronic progressive glaucoma is, as we have said, one of the most obstinate maladies with which the surgeon has to deal. To be able to prevent its progress is a notable advance in modern ophthalmology.

We have up to this time depended absolutely upon iridectomy to prevent the ravages which glaucoma so often makes in affected eyes. In chronic cases of glaucoma the fact has been long recognized that iridectomy may prove powerless to stay the progress of the dread disease. In most of my patients iridectomy had been previously performed without producing any good results. Some of them had been subjected to sclerotomy, and this had failed as signally as iridectomy to prevent the destructive process due to the increasing intra-ocular tension. There seems to be good reason to believe, then, that we have in cervical sympathectomy a new and efficient surgical procedure for the relief of severe pain and for the ultimate removal of one of the opprobria of surgery.

The theory upon which cervical sympathectomy does good in all these different ailments is of the greatest interest, though it is not

entirely clear as yet. When we review what is known of the physiological action of the cervical sympathetic, it is not surprising that cervical sympathectomy produces such a beneficial effect upon exophthalmic goitre. There are two organs that are mainly affected by irritation of the cervical sympathetic. These are the eye and the heart. Irritation of the cervical sympathetic causes distinct acceleration of the heart-beat. This is not only a prominent symptom of exophthalmic goitre, but is also the symptom upon which many of the other manifestations of the disease, especially those in the nervous system, probably depend.

Claude Bernard, the famous French physiologist, has shown experimentally that stimulation of the cervical sympathetic causes a distinct tendency to exophthalmos. On the other hand, resection of the cervical sympathetic causes a sinking in of the eyeball, a diminution of the width of the optic ocular slit, and a fall of the upper eyelid. How completely this experimental observation of the results of resection of the cervical sympathetic in animals agrees with the results of corresponding operations in human beings can be very well seen in some of the epileptic patients upon whom unilateral resection of the cervical sympathetic has been performed.

In these patients there is a distinct difference in the appearance of the two eyes,—the eye on the side operated upon being much less prominent, the ocular slit narrower, and the upper lid somewhat prolapsed.

It is not surprising, then, that the exophthalmos of Basedow's disease should disappear after bilateral resection of the cervical sympathetic. The exophthalmos in this affection is really due to paralysis of the internal orbicularis muscle. The prominence of the eyeball is a muscular phenomenon, and is not due, as has been believed, to the dilatation of blood-vessels behind the eye pushing that organ forward. When this older theory of the causation of the exophthalmos in Basedow's disease was accepted, it was thought that section of the cervical sympathetic produced a vasoconstriction of postocular vessels by paralyzing the dilator fibres of the vasomotor nerves. Perhaps both of these causes contribute to the effects produced.

As a result of this effect upon the eye, the dilatation of the pupil disappears, and often serious interference with ocular movements is also removed. The von Graefe symptom, for instance,—the fail-

FIG. 9.—Married woman, thirty-eight years of age, who had suffered from Basedow's disease for twelve years. The thyroid was large and tender. There was a marked tendency to diarrhœa, and she was nervous and

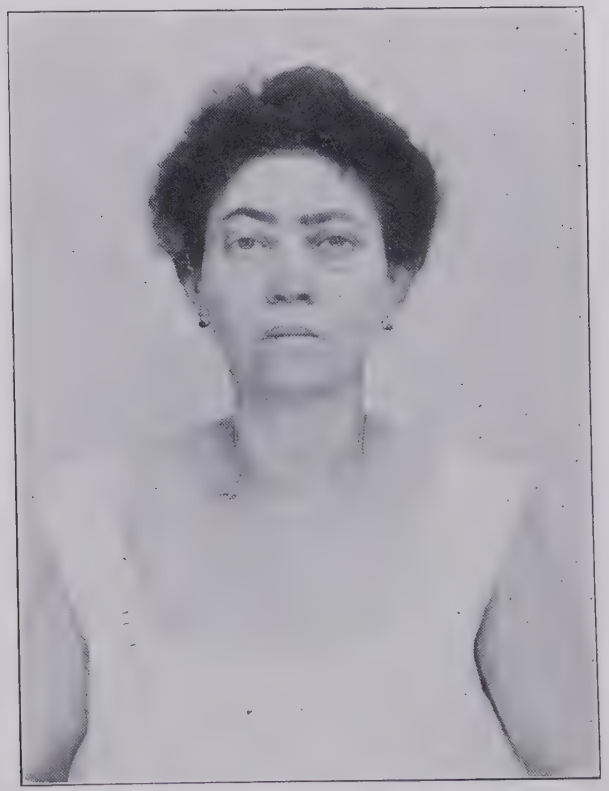

FIG. 10.—The patient shown in Fig. 9, after complete bilateral exsection of the cervical sympathetic. The goitre is lessened in size and sensitiveness, the tendency to diarrhœa is corrected, and the nervous symptoms are very much improved.

FIG. 11.—Married woman, thirty years of age, who has suffered from Basedow's disease for two and a half years. It was almost impossible to close the eyes; over one-half centimetre of the sclera could be seen above and below the pupil. Tachycardia and nervous symptoms were marked features of the case.

FIG. 12.—The patient shown in Fig. 11, after bilateral resection of the cervical sympathetic. Exophthalmos is greatly improved, the goitre is much smaller, and the tachycardia and tremor have disappeared.

ure of the upper lid to follow the movements of the eyeball,—can no longer be detected. This is an early sign of the presence of exophthalmos and is always present so long as the eyeball remains prominent. It also regulates Stellwag's symptom, which is the well-known failure of eyes affected by exophthalmos to wink every few moments, as does the normal eye. Moebius's symptom, or the failure of the eye to take up an extreme position of convergence, is also corrected by cervical sympathectomy. The goitre of Basedow's disease is slowly but surely lessened. A distinct diminution in size can be noted immediately after the operation, and the thyroid also becomes gradually less prominent. The disappearance of the exophthalmos and the diminution in size of the goitre as a result of cervical sympathectomy are shown very graphically in the accompanying illustrations reproduced from photographs of patients taken before and after the operation. (Figs. 1 to 14.)

Probably the most beneficial effect produced by the resection of the cervical sympathetic is the regulation of the cerebral circulation. Immediately after the operation there is a passing congestion of the face, with a marked tendency to lachrymation and an increase of nasal secretion on the side operated upon. These symptoms soon disappear, but the effect upon the circulation within the brain seems to remain. As the result seemingly of brain anæmia, nervous symptoms are prominent in Basedow's disease. It will be shown further on that the benefit derived from cervical sympathectomy in epilepsy is probably due to the removal of brain anæmia by the operation. When the vasoconstriction produced by excitation of the cervical sympathetic comes to an end, the brain receives once more its normal amount of blood. The nervous symptoms of Basedow's disease are favorably influenced in the same way.

After the resection patients do not suffer from tremor nor from the febrile feeling and the excessive tendency to sweating which are annoying symptoms of exophthalmic goitre. The hyperexcitability of the gastro-intestinal tract which produces the alternate constipation and diarrhœa that are such marked features of the disease are also overcome.

It is important to remember in connection with the operation that it is from the lowest cervical ganglion particularly that the accelerator nerves to the heart muscle are given off. Operation, therefore, on the cervical sympathetic without the removal of this

ganglion is not likely to produce the good results in exophthalmic goitre that are noted when complete resection with removal of the three ganglia is accomplished. Besides this, the vertebral nerve which contains a number of vasomotor filaments that regulate intracerebral circulation is given off from this lowest ganglion. As the nervous symptoms of Basedow's disease are at least as important as the heart or eye symptoms, the operator should not fail to afford the full measure of relief by removing this ganglion when the sympathetic cord is in his hands.

Thus cervical sympathectomy is an important remedial measure for exophthalmic goitre, which is an extremely obstinate disease; but relief is assured only when the complete operation is done, and especially when the whole of the lowest cervical sympathetic ganglion is removed. If a portion of this important nervous structure were allowed to remain, the operation might fail to afford relief or might even produce an effect opposite to that intended by setting up an irritative condition in the ganglionic substance.

The theory on which resection of the cervical sympathetic is done for epilepsy involves the hypothesis that epileptic attacks are due to cerebral anæmia. Many neurologists accept this view as to the pathogenesis of the spasmodic seizures, and some physiologists are on experimental grounds inclined to teach that vasoconstriction of the cerebral vessels always suffices to produce convulsive effects. It is well known that the production of cerebral anæmia in animals leads to loss of consciousness accompanied by convulsions. Claude Bernard in his classical experiments demonstrated that excitation of the cervical sympathetic leads to relaxation of the blood-vessels of the head, to flushing of the face, and to increasing temperature of the hyperæmic parts. Overaction of these nerve impulses might therefore readily produce the pale face, the cry, and the loss of consciousness characteristic of epileptic attacks. Experimenters have produced vertigo and convulsions by irritation of the cervical sympathetic. It would seem, then, that the cervical sympathetic contains nerve-filaments that are distributed to the vessels of the brain and are capable of carrying impulses which cause narrowing of the lumen of those vessels and consequently brain anæmia. So any irritation of the cervical sympathetic may lead to such attacks of cerebral anæmia and consequent epileptic seizures. Section of the cervical sympathetic, by cutting off the avenue through which

FIG. 13.—Girl, sixteen years of age, with Basedow's disease, after a duration of eight months. There are considerable exophthalmos, tremor, and tachycardia. The nervous symptoms are pronounced and the gastro-intestinal disturbances annoying.

FIG. 14.—The patient shown in Fig. 13, three and a half years after total bilateral exsection of the cervical sympathetic. The improvement has been progressive, and there have been no relapses into former symptoms.

such impulses are carried, prevents the occurrence of brain anæmia, and so permits the uniform and constant nutrition of brain-tissues on which cerebral stability depends.

The section of the cervical sympathetic also seems to act favorably by preventing the flow of nervous impulses from the thoracic and abdominal cavities. As is well known, the sympathetic nervous system is distributed to all the important organs, and with special profusion of terminal filaments to the large abdominal organs. The stomach, the intestines, the liver, the kidneys, and the genital organs are supplied with a rich set of nervous filaments from the sympathetic system, and there is no doubt that all of these are capable of producing reflex effects upon the other parts of the body, and especially upon the nervous tissues, by means of this sympathetic distribution. This is in fact the main reason for calling that part of the nervous system the sympathetic.

Section of the sympathetic cord in the neck prevents the reflexes that ordinarily might be sent from irritated abdominal or pelvic organs to the brain. There is no doubt in the minds of experienced neurologists that epilepsy is often due to nervous reflexes coming from organs other than the brain. Unfortunately, when the system has become accustomed to convulsive attacks like epilepsy, a condition is produced that may lead to the occurrence of such attacks even after the original source of irritation is removed. The basis of this condition may be due to changes in the sympathetic ganglia that have taken place as the result of the constant and long-continued flow into them of irritative impulses from important organs which are seriously affected. We have in the resection of the cervical sympathetic for epilepsy the most promising form of treatment that has yet been offered to the profession and the one which corresponds exactly to the indications offered by the probable pathogenesis of the disease. The etiology of epilepsy is by no means simple; it involves many different causes. It cannot be hoped, then, that any one form of treatment will relieve all cases; but in cervical sympathectomy we seem to have a method that is more encouraging than any other presented in recent years.

It is evident, therefore, that resection of the cervical sympathetic will occupy a prominent place in the future progress of surgical science. This is surprising when we think only of the unimportant position accorded to the sympathetic system by the writers of

a generation or two ago. It is not surprising, however, when we consider that the cervical sympathetic system represents the tract of nerve-fibres through which all disturbances in the large organs of the body are reflected back upon the general nervous system. As they are the carriers of reflexes from the abdominal and thoracic organs, from the respiratory, the circulatory, the digestive, and the genital tracts, it is no wonder that important effects should follow their section. According to the older physiological ideas, these effects were thought to be surely harmful. Experience has taught us that no serious sequelæ follow section of the cervical sympathetic and that we can thereby control especially the exaggerated reflexes that are liable to produce pathological results in delicate organs. I think we cannot overestimate the importance of the field that is opened up for surgical advance in the domain of the cervical sympathetic. Let us hope that it will be cultivated with due care and conservatism.

RADICAL CURE OF INGUINAL AND FEMORAL HERNIA; SLIDING HERNIA; HYDROCELE OF THE CANAL OF NUCK; EPITHELIOMA OF THE FACE; SARCOMA OF THE UPPER JAW.

CLINICAL LECTURE DELIVERED AT THE GENERAL MEMORIAL HOSPITAL, NEW YORK CITY.

BY WILLIAM B. COLEY, M.D.,

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RADICAL CURE OF INGUINAL AND FEMORAL HERNIA.

GENTLEMEN,—Our first patient this morning is a boy seventeen years of age, who is suffering from a large inguinal hernia with descent of the intestines into the scrotum. He has worn a truss for several years, but he has not improved under its use, and his hernia has continued to enlarge somewhat and to cause considerable discomfort. In these cases we do not always advise operation immediately, though, as a rule, in young persons over fourteen years of age a radical operation for the cure of the hernia is the most conservative advice that can be given. The risks of operation are practically *nil,* and the chances of cure by a truss are very slight. Under the age of four years I consider that a large proportion of patients suffering from inguinal hernia can be cured by the use of the truss, and one carefully applied and suitably adapted to the case should always be given a thorough trial. After the age of four the question of radical operation must always be considered. Until about the age of puberty, however, it seems better, as a rule, to advise careful application of the truss for one or two years before deciding on operation. If, after a year or two of truss treatment, the hernia still comes down and the ring is large and patulous, I think there is very little possibility of cure by this means and practically nothing to be gained by waiting longer, and so I usually advise operation.

Our patient of this morning is a typical case for the employ-

ment of the radical operation for the cure of hernia. Up to the age of fifty years, as a rule, patients in good health make excellent subjects for the radical operation. There are certain exceptions. Stout persons with very large irreducible scrotal hernia do not prove satisfactory subjects for radical operation. At times in large reducible hernia of long standing the abdomen has become accustomed to the absence of a certain amount of its visceral contents. In these cases the reduction of the hernial contents into the abdomen causes a decided increase of intra-abdominal tension and distinctly interferes with respiration. Radical operation under such circumstances has many more risks than in ordinary cases of even large hernia and the prospect of a permanent cure is not very promising. Old age, especially above sixty-five, usually constitutes a contraindication to radical operation for hernia. There are certain patients, however, even up to the age of seventy, in whom conditions may demand the employment of radical operation, and the record of its success under these conditions thoroughly justifies the surgeon in attempting it. Some old people suffer from herniæ which are not large, yet are very difficult to control with a truss; such patients are liable to suffer from strangulation at almost any time, and such an accident is even more serious at this age than it would be in younger patients. If these older patients, then, are in good health and are not so stout that the fatty layer in their abdominal walls interferes with the operation or threatens to prevent good union afterwards, operation is advisable, and will usually give excellent results.

For the radical cure of inguinal hernia, I believe that the Bassini method is by far the best one and the least liable to be followed by relapse. Eleven years of personal experience with upward of nine hundred cases of radical operation certainly justify this conclusion.

In doing the operation I always wear rubber gloves or rubber finger-cots myself and insist upon my assistants and nurses wearing rubber gloves. Since we have employed this rubber protection our cases of suppuration after operation have been distinctly reduced. Before the employment of gloves, in ninety-six per cent. of the cases I obtained primary union; in about four per cent. some suppuration occurred. In the first two hundred cases operated upon since the employment of the gloves, suppuration occurred only

once. Cultures taken from the skin of the patient before this operation showed the presence of a streptococcus in pure culture, and the pus that developed was shown to contain a similar streptococcus in pure culture. It is evident that the suppuration occurred as the result of infection from the imperfectly sterilized skin of the patient. It is, of course, extremely important that suppuration should be avoided as far as possible. The collected experience of a great many surgeons shows that relapses of hernia after radical operation occur especially in those cases in which post-operative suppuration has been noted. The granulation tissue which forms after the occurrence of a suppurative process is much weaker than the normal tissues, and the hernia is able to find its way once more out of the abdominal cavity.

Our incision in this case is from three and one-half to four inches long, over the inguinal canal and parallel with Poupart's ligament, about one-half inch inside of the ligament. After going through the skin and subcutaneous tissues, all bleeding vessels are caught with forceps, so as not to permit any infiltration of the tissues with blood; this eliminates the danger of infection which is incident to the presence of an especially favorable culture medium. The first landmark in the operation is the aponeurosis of the external oblique muscle, which is cut by the knife on a grooved director, the director being withdrawn once or twice so as not to cut the muscle beneath. If the muscle were cut, it would be much weakened, besides which bleeding would occur and obscure the field of operation. The aponeurosis is then dissected outwardly to Poupart's ligament and inwardly as far as the rectus muscle. We now lift up the tissues of the sac at the external ring. With blunt scissors, or better with thumb and forefinger of the right hand, we carefully dissect the sac and the cord from the other tissues lying below, and then separate the sac itself from the cord. In making this dissection we come upon the infundibuliform fascia, which is thin and delicate; this surrounds both cord and sac. As I hold the sac up to the light it is seen to contain a small mass of omentum, the vessels of which show through the thin membrane in which it is contained. We dissect through the infundibuliform fascia and easily separate the vas deferens and its accompanying vessels from the hernial sac. This is best done with the thumb and forefinger of the right hand or with the aid of a piece of dry gauze.

The history in this case shows that the hernia was reducible before ether was administered to the patient. It is always well to determine this fact in advance, for the simplicity of the operation depends on the absence of adhesions. We do not expect to find adhesions in this case, yet, as we continue to separate the sac, there are, apparently, some slight adhesions present. There are a number of areas of thickening in the sac membrane and some adhesions have to be broken up in separating the sac from surrounding tissues. The existence of these thickenings and adhesions shows that the truss worn had caused some chronic irritation and that it would not have been long before the omentum would have become adherent and the hernia irreducible. It is important, as a rule, not to advise the use of a truss when it is an almost constant source of discomfort, for chronic inflammatory conditions are sure to develop that make the dangers from the hernia greater and the risks of the subsequent operation more serious.

In this case the sac does not communicate with the tunica vaginalis of the testicle; it is, therefore, evident that the hernia is of the acquired and not of the congenital variety. In congenital hernia the hernial sac and the vaginal tunic are continuous. With care here it is always possible to separate the lower end of the sac and remove it. The sac is dissected from the cord well above the internal ring; this can be accomplished very easily and thoroughly without cutting the internal oblique muscle above for an inch or so, as Dr. Halsted recommended in his method, but which step he has, I believe, recently abandoned. As we lift up the sac now, it is seen that we are well within the internal ring and the fold of peritoneum running to the bladder can be seen very easily. On the outer side, the fold running to the cæcum is also plainly visible. I like always to have a clear view of the neck of the sac before tying it off, as this prevents all possibility of including any other tissues in the ligature except the hernial sac itself.

For the ligation I always use No. 1 catgut, which is applied well above the neck of the sac. Before the ligature is passed around the sac the latter is transfixed with a needle. This prevents all possibility of the ligature slipping off. The sac is tied off as high up as we can go, in this case to the beginning of the folds of peritoneum described. After ligation the sac is cut off about one-quarter of an inch below the ligature and is then pushed up

into the abdominal cavity, leaving absolutely no funicular process. In cases of congenital hernia we leave sufficient sac below to cover the testicle and remove the remainder. The cord and its vessels are then lifted upon a piece of tape, while the tissues are brought together beneath it. The aponeurotic layer is held back well by retractors so as to leave the site of suturing as free as possible. The first or deep layer of sutures is inserted by means of a curved Hagedorn needle. Personally, I never employ a needle-holder. After a little experience in the use of the Hagedorn needle with the fingers alone, the insertion of sutures becomes easier and surer without a needle-holder.

It is seen that the patient's abdomen is somewhat disturbed by efforts at retching, due to the fact that the ether narcosis is not quite deep enough, but that even with the marked straining there is no bulging of the abdominal contents where the wall is open. The sutures must, of course, not be inserted while the abdomen is being strained; but as a matter of fact the thorough closure of the peritoneum by high ligation of the sac alone has in this case served to retain the abdominal contents.

The first suture is the most important one. The finger is inserted below the internal oblique muscle at the level of the internal ring and a suture is passed through this structure and carried over to the shelving process of Poupart's ligament. It is inserted in such a way as just to touch the cord when the latter is held vertical to the plane of the abdomen. This furnishes a uniform guide as to how high up in the canal the sutures should go. The use of the index-finger of the left hand beneath the muscle absolutely precludes the possibility of injuring the peritoneum during the course of the insertion of the sutures. Four or five interrupted sutures of chromicized kangaroo tendon are inserted below the cord. After these are in place I insert an additional suture that is not used by Bassini, putting it in just above the cord, so as to close the internal ring as completely as is deemed advisable. This furnishes an additional safeguard against recurrences by making the new internal abdominal ring as small as is consistent with the free exit of the cord from within the abdomen. Spermatic cords are, of course, of very different sizes, and the surgeon must use his own judgment in inserting this additional suture so as not to interfere in any way with the circulation of the cord. I have never had any

difficulty in this matter, and I feel sure that this extra suture has been an important aid in securing freedom from relapse. After the deep sutures have been inserted the aponeurotic layer is also closed from above downward. While interrupted sutures of kangaroo tendon are used in the deeper layer, the aponeurotic layer is closed with a continuous suture of kangaroo tendon of rather fine caliber about the size of No. 1 catgut. These sutures are chromicized, but not to such an extent as to allow them to persist in the tissues long enough to produce irritation. Non-absorbent sutures frequently give rise to irritation, and this so weakens the abdominal wall at these points that relapse is common. The kangaroo tendon is rendered resistant enough to last for four or five weeks, and this has always proved satisfactory in my experience; it is less harsh, more pliable, and more durable than catgut treated in the same way.

The present case requires five sutures for the internal layer. The last suture down near the symphysis pubis includes a portion of the conjoint tendon on the inner side, and Poupart's ligament on the outer side. In passing these sutures it is important that the nearness of the iliac vein should be realized and care taken to avoid puncturing it. In making these radical operations for hernia it is very advisable that, as far as possible, the layers of muscles and structures in the abdominal wall should stand out as clearly and distinctly as in an anatomical dissection. The continuous suture for the aponeurosis can be inserted very rapidly here with a curved surgical needle without a needle-holder. Care should be taken not to sew up the aponeurosis too close to the symphysis pubis, lest the cord should be compressed at this point. After the aponeurosis is closed it can be seen how thoroughly protected the abdominal wall is against recurrence of the hernia. The only weak place in the wall is the point at which the cord emerges through the new internal ring, and this is protected by the overlying layer of the external oblique aponeurosis. Recurrence can only take place by the hernial protrusion forcing itself directly through the aponeurotic layer at this point, or by its taking a right-angled course for some inches beneath the external oblique to the external ring. This course is highly improbable, unless the tissues have been weakened by the occurrence of suppuration.

My own statistics serve to show how little is the danger of

relapse in these cases. I have operated upon more than eight hundred cases of inguinal hernia by this method, and more than five hundred of the cases have been followed for from one to nine years, with a record of only six relapses. It is noteworthy that most of these relapses occurred in cases in which some suppuration followed operation. No drainage is ever employed after these operations. The risks of the operation are very slight; in nine hundred and fifty cases of various forms of hernia I have had but two deaths. One of these took place from ether pneumonia. The other was an extremely complicated case of large adherent irreducible omental hernia; the exact cause of death could not be ascertained, but was probably due to volvulus. Recent experience seems to show that, except for unforeseen accidents not directly connected with the operation itself, the mortality of operations for the radical cure of hernia is in skilful hands practically *nil.*

The dressings are allowed to remain for one week and the patient is kept in bed for two weeks. He is allowed to go home at the end of two and one-half or three weeks. For two weeks after he leaves the hospital the patient is required to wear a spica bandage. After that no support of any kind is required. I am old-fashioned enough to use ten per cent. iodoform gauze immediately over the wound; in dressing it, above this are placed several layers of moist bichloride gauze (plain sterile gauze wrung out in 1 to 5000 bichloride solution). After this there are several layers of cotton, and the dressing is kept in place by means of a spica bandage firmly applied. The latter constitutes a very important part of the dressing; firm pressure is secured by it, and is constantly maintained, so that no strain is allowed to come on the edges of the wound even during any retching that may occur as a consequence of the narcosis. This dressing is allowed to remain for a week, unless there is some indication for its removal.

In children the same sort of dressing is applied, except that the outer spica bandage is of plaster of Paris, in order absolutely to prevent movements on the part of the child causing any disturbance of primary union. Primary union is, after all, very important in the prevention of relapses. This plaster-of-Paris bandage is removed at the end of a week, and is replaced by an ordinary spica bandage for a week or ten days.

Our next patient is a man of thirty-seven who is suffering from large double inguinal hernia. He has the flabby abdominal walls that especially predispose to the occurrence of hernia. When we make our incision on the right we find a large internal ring in the midst of rather flabby tissue that shows us how easy it was for hernia to occur and how difficult for a truss to retain it. This hernia is evidently of the acquired and not the congenital variety. It is important carefully to dissect the sac from the cord. There is a certain amount of danger of injury to the vas deferens, but this has been exaggerated by most writers; in my experience I have never injured it, and there seems to be no good reason for any accident to this structure if a reasonable amount of care is exercised. We find also a large and patulous external ring. There is no aponeurosis of the external oblique muscle except high up on the abdominal wall, near the internal ring. This structure is practically entirely absent in the lower part of the abdomen. Cases in which this anomalous development, or rather failure of development, exists are less satisfactory than those in which all the normal structures of the abdominal wall are present; but with the exercise of care during the operation, and by placing the deep sutures well over to the edge of the rectus muscle, a successful closure of the hernial openings is accomplished and relapses need not be feared.

On the left side, the hernia is much smaller than on the right, being more of a bulging in the canal than actual descent into the scrotum. The same weakness of the abdominal wall, however, that was noticed on the other side, is found to occur here also. This is evidently one of the cases in which the weakness of the abdominal wall predisposed to the occurrence of double hernia. This is apt to be the case in patients in whom double herniæ occur as the result of no definite accident but simply as an incident to their ordinary occupation. At times, a certain amount of fat tissue is found in the canal in inguinal hernia. It is not so common as in femoral hernia, but it is always advisable to remove it. Its presence rather weakens the tissues and its removal allows of better and firmer coaptation.

In dressing these cases of hernia, I have found it of great service to employ what we call here a platform support for the testes. Occasionally, one finds after operation, as the result of the manipulation of the cord and the reaction which occurs after it, that the

testicle becomes swollen and painful and a source of considerable discomfort. This is especially apt to be the case after double operation. We have found that by supporting the scrotum well up on the abdominal wall in the way described, this swelling is not so apt to manifest itself, and when it does is much more limited in amount and in the discomfort which it produces.

Our next patient is a woman of thirty-seven who has been suffering for some time from femoral hernia. As a carefully fitted truss proved a source of almost constant discomfort, radical operation was advised. As a rule, radical operations should be advised in femoral hernia unless some contraindication be present, as a cure of the condition can seldom or never be obtained by the use of a truss. I consider the purse-string method the simplest and best operation for this condition. The incision for it is made parallel with Poupart's ligament, just as in Bassini's operation for inguinal hernia, except that it is a little below the ligament instead of above it. The old vertical incision which used to be recommended for femoral hernia is much less satisfactory for the purposes of a radical operation. The guide to the femoral canal is the falciform process and the lower edge of Poupart's ligament. We find here the characteristic masses of extraperitoneal fat that commonly occur in the femoral canal; these are frequently taken for masses of omentum. In this case we find a small hernial sac in the midst of the fat. We dissect off all the extraperitoneal fat and treat it just as if it were omentum, tying it off wherever necessary, but considering it important to get it out of the way in order to have a clean field for introducing the sutures. While femoral herniæ are not very frequent, we have had four cases to operate upon in the last week. In all of them the characteristic fat-masses varied in size from a filbert to that of a walnut. In but one of the cases was anything found in the sac of the hernia, and in this instance there was a small mass of adherent irreducible omentum.

I have used Bassini's methods for femoral hernia in sixteen cases. In the great majority, however, I have found the so-called "purse-string" method more suitable, and it is this method that I shall apply in the present case. Just as in inguinal hernia, the sac is freed well beyond the neck, then it is tied off high up and the canal below it is closed by means of a purse-string suture of

chromicized kangaroo tendon about the size of No. 1 catgut. The suture is introduced first through Poupart's ligament, or the inner portion of the roof of the canal; from here it passes downward into the pectineal muscle, or floor of the canal, outward through the fascia lata overlying the femoral vein, and upward through Poupart's ligament, or roof of the canal, coming out about three-fourths of an inch from its original point of introduction. Needless to say, this suture must be introduced with the greatest care. Though I have used it in over forty cases, I never insert the needle into the outer part of the canal in the immediate neighborhood of the femoral vein without a feeling of anxiety. The vein lies just beneath the fascia lata, and may very easily be punctured. Because of the danger of puncture, I formerly used a blunt needle in performing this operation; but during the past eight years I have used a short, curved Hagedorn needle. The shortness of the needle enables me to direct its point very carefully. I have never yet had the misfortune to injure the vein, but in the use of this suture this is the crucial moment of the operation. On tying this suture, the floor of the canal is brought into apposition with the roof and the femoral opening is completely obliterated. The superficial fascia is then closed with fine tendon, and the skin is brought together either with catgut or silk. I consider this method of closing the femoral canal as having many advantages over the method proposed by Bassini; it is simpler than Bassini's method and is comparatively easy of performance. In cases where the hernial opening is very large, Bassini's method might perhaps be preferable. I have used this purse-string method in over forty cases without the occurrence of a single relapse so far, and without noting any suppuration. I have had one recurrence in a case operated upon by Bassini's method, in which the femoral hernia was of large size and suppuration occurred in the wound. Even in this case only a very slight relapse took place, and five years after the operation the patient is suffering no discomfort, experiences nothing more than an exaggerated impulse, and does not wear a truss.

After operations for femoral hernia it is not necessary to keep patients in the hospital as long as for inguinal hernia. They are usually allowed to sit up on the tenth day and to go home on the twelfth or the fourteenth day. In none of my cases has a truss been worn after operation for femoral hernia.

"SLIDING HERNIA," OR HERNIA "PAR GLISSEMENT."

I have here a very interesting case of hernia that was operated upon last week. The hernia was a large inguinal hernia on the right side that was irreducible. It proved to be, as was suspected before the operation, a case of sliding hernia. In these cases the usual peritoneal sac is imperfect, the posterior portion generally being lacking. Some operators consider that this form of hernia occurs more frequently on the left than on the right. My own experience in over thirty cases of cæcal and sigmoid hernia includes many more cases of the cæcum than of the sigmoid. Clinically, this form of hernia can be frequently recognized by the fact that attempts to replace the protruding intestine usually fail. The reduction of a certain amount of the hernia is not difficult, but a considerable portion of the hernial mass remains, and this can usually be differentiated by palpation from adherent omentum. In the present case the operation was long and rather difficult. Notwithstanding this fact, however, the temperature chart shows no febrile course and the incision is perfectly healed by primary union. The prognosis of these cases as regards relapse is better than might be expected. The patient will be kept in bed somewhat longer than in an ordinary case, and will be directed to wear a support after leaving the hospital.

HYDROCELE OF THE CANAL OF NUCK.

Here is a case that is of interest mainly because of its rarity; it was a typical example of a hydrocele of the canal of Nuck. Our patient is a young negress about sixteen years of age, who came presenting a cystic tumor of the inguinal region. She was operated upon by the house surgeon, Dr. Livermore, a week ago. Some of the fluid removed proved to be of a perfectly clear character. The tumor was of pear shape and occupied exactly the position that an inguinal hernia would under the same circumstances. It was, however, impossible to reduce the tumor.

I believe that authors have divided the cystic tumors that may occur in this region in women—the so-called feminine hydroceles—into five classes. In the first class are included tumors that are really diffused hydroceles occurring in the cellular tissue enveloping the round ligament. In this case the cellular tissue near the round ligament is transformed into a serous membrane,—a condi-

tion similar to that which not infrequently occurs in the corresponding structure in a hydrocele of the spermatic cord. The second group consists of cases in which an accumulation of fluid occurs in an actual prolongation of peritoneum into the inguinal canal; this is a hydrocele of the canal of Nuck proper, the communication with the abdomen remaining, and this form is very rare. The third variety of hydrocele differs from the second only inasmuch as the pouch of peritoneum is shut off and no longer communicates with the general abdominal cavity. The fourth group contains a case of encysted hydrocele in the connective tissue about the round ligament; these are rather similar to the first variety described. The fifth group of cases comprises those in which an accumulation of fluid occurs in the remains of an old hernial sac. This fifth variety of *hydrocele muliebris* is rare and can usually be readily diagnosed by the previous history of hernia. Hydrocele of the hernial sac without the presence of a portion of irreducible omentum and the history of long-standing hernia is a rare complication. The remaining four varieties of feminine hydrocele may, for practical diagnosis, be synthetically grouped into two main classes. The first includes all those cases where the cyst is found in a true peritoneal pouch or diverticulum of Nuck. The other group includes all cases where the cyst has developed in the cellular tissue about the round ligament. To this second group of cases belong most of the feminine hydroceles, if we may judge from analogous cases of hydrocele of the spermatic cord.

In our present case we had a true hydrocele of the canal of Nuck. It was, however, perfectly shut off from the general abdominal cavity. In a number of cases of hernia in children upon which I have operated, a hydrocele in the cellular tissue about the cord was found quite independent of the true hernial sac. This condition is very frequently diagnosed as adherent omentum.

EPITHELIOMA OF THE FACE.

Our next case is an epithelioma of the face, about an inch and a half in vertical diameter and about an inch in horizontal diameter, situated on the cheek slightly below and external to the left eye. The patient is a man of sixty-four, who about two years ago noticed the development of a pimple or wart in this region. He picked at it several times and it began to grow larger, but it was

not until it had reached its present size that he considered it necessary to do anything more than apply various remedies at the suggestion of friends. There is no history of trauma in the case, nor of burn nor any other source of chronic irritation. The neoplasm is typical in character and has distinctly indurated edges with a somewhat depressed centre. There is no retraction of the lower lid, and the new growth is freely movable, evidently having contracted no attachment to underlying tissue. The operation will be performed under cocaine. Incision in the skin causes absolutely no pain, and we shall remove not only the new growth itself, but about a quarter of an inch of healthy tissue beyond its margin.

There is a question in the minds of medical authorities at the present moment whether these cutaneous epitheliomata should be treated by the use of some caustic, or by the X-rays, or by the knife. From the reports of trustworthy conservative clinical observers, it would seem that a cure may be effected by any of these means. Cure by the use of caustic paste is, however, very slow. With regard to the technic of the employment of the X-rays and as to the eventual result in these cases, we are not as yet definitely informed, but the recent successes of Williams, of Boston, and others are very encouraging. It seems advisable, then, to use the knife in these cases until our information becomes more definite. The excision is much simpler, easier, and more effective than any of the other methods.

The prognosis in epithelioma of the face is better than that of neoplasms in almost any other location. About thirty-three per cent. of cures seems to be a fair average of the results in these cases.

MIXED TOXINS FOR SARCOMA.

The subject of recurrent inoperable sarcoma of the bones of the face is extremely interesting because of the pitiable condition into which patients are finally brought. I present here a case of spindle-celled recurrent inoperable sarcoma of the superior maxilla, which has shown great improvement. The patient is a man of about forty-six, who, in April, 1899, began to develop a tumor of the upper jaw on the right side of his face. The tumor was removed in June, 1899. In a few weeks it recurred and grew very rapidly. In August, 1899, the larger part of the superior maxilla was removed. A few months afterwards the neoplasm

reappeared, and in June, 1900, it had reached the size of an orange. At this time the external carotid artery was tied by Dr. Andrew J. McCosh and the rest of the superior maxilla was removed. In July, 1900, the growth returned and grew so rapidly that on October 19 it was pronounced hopelessly inoperable by Dr. McCosh, who referred the man to me as a suitable case for the injection of the mixed toxins. Four weeks ago the injection of the toxins of erysipelas was begun. At that time there was a tumor on the outside of the face the size of a hen's egg; the main part of the tumor, however, was within the mouth. There was a bulging of the palate that completely filled the vault of the mouth. The injections were given mainly into the tumor within the mouth. One-half minim of the toxins proved sufficient at the beginning to cause a decided reaction. Altogether in a month's treatment eighteen injections were given; none of them was of more than two minims, and the average was about one minim in amount. The growth began rapidly to necrose after the injections had been employed for about a week, and then sloughing set in. The tumor was curetted and all the broken-down material removed. The tumor on the inside of the mouth has now nearly disappeared, while on the outside, in place of the tumor, there remains a cavity with a perfectly clean base. This case is a very signal example of what can be done sometimes for inoperable sarcoma when the patient's disease has progressed to a degree that apparently makes it hopeless.

Whether this remarkable improvement will continue until a cure is effected is, of course, impossible to foretell.[1] I have had recent cases, however, that would make the prospect for this one very promising. In November I presented a patient before the New York Surgical Society who in October, 1900, had an inoperable, small, round-celled sarcoma of the parotid gland. The mixed toxins were injected in doses of from one and one-half to three minims. The treatment was continued from October to June, 1901, with the result that the tumor has entirely disappeared and he is at present free from any trace of a recurrence. The diagnosis in this case was confirmed by three pathologists. As a rule, the round-celled sarcoma yields to the treatment by the mixed toxins much less readily than the spindle-celled type.

[1] A few weeks later the toxins lost their effect and the tumor began to grow again. X-ray treatment was tried for more than a month, but there was no apparent effect either in decreasing the growth or lessening the pain.

PERFORATING BULLET WOUNDS OF THE CENTRAL NERVOUS SYSTEM.

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The effects of perforating bullet wounds of the central nervous system constitute a subject of much interest alike to the surgeon and to the neurologist. The following illustrative cases came under my personal care and observation whilst in charge of the Langman Civil Hospital, South Africa.

Case I.—October, 1900, the Princess Christian train, on its way south after the fight at Dalmanutha, dropped twenty of its dangerous cases at the Langman Hospital. Among them was a young officer (G.) who had an extensive wound in the base of the skull and neck, which had been sewn up. During the fight the captain in charge of some big guns was killed, and this young officer, in spite of the severity of his wound, directed that he should be propped up against a wheel, and, although in a most deplorable condition, took over the command. His small body of men was surrounded by Boers, who on the approach of reinforcements decamped rapidly.

G. reached the Langman Hospital between twenty-four and forty-eight hours after his injuries. On admission blood and serum were oozing from the wound, the edges of which were very red. The stitches were removed and the whole extent of the wound was explored. It extended from the right mastoid region to the anterior third of the clavicle; it was about two inches wide, of the same depth above, and less deep below; the whole of the sternomastoid was ploughed up and destroyed. On examining the external carotid with the finger it could be felt pulsating in the depths of the wound. The whole wound was full of fragments of bone, the main mass of the mastoid process having been blown down the neck to just above the clavicle, from which situation it was removed. In the

upper part of the wound the finger found the hypoglossal nerve, and below it the occipital artery could be felt pulsating; beneath these structures the external carotid artery was uninjured. The posterior belly of the digastric was exposed and torn; above it was a large hollow cavity, bounded in front by the parotid gland and the ramus of the jaw, which was stripped of its coverings on the posterior and internal aspects; the external carotid could not be discovered here by its pulsation. The finger then passed up through the base of the skull, where a hole was discovered large enough to admit two fingers; the whole of the mastoid process and the adjacent petrous bone had been blown away. The upper part of the wound was full of brain matter reduced to a sanguinary pulp; at least one ounce was removed at this first dressing; cerebrospinal fluid trickled out in large quantities after the brain matter was removed. This was the wound of exit. The wound of entrance was about four inches above this and a little behind it. It was an ordinary Mauser puncture,—a small clean-cut hole in the scalp, circular in outline, diameter about three-eighths of an inch; there was a similar hole in the parietal bone beneath. This wound was full of blood-clot and had red edges; there was no swelling around and no deep extravasation of blood. There were no indications of fissuring of the skull around the wound, but almost certainly these were present. The external ear and meatus were perfect; there was complete facial paralysis on this side and complete deafness. The general condition of the patient was extremely good: he was perfectly conscious, understood what was said to him, answered properly, and took his food well. He complained somewhat of headache, but principally of a stiff neck. Temperature was 99° F.; pulse strong, full, regular, 72; respiration normal; pupil larger than on the normal side, though reacting well to light; no strabismus; no paralysis of arms or legs; temperature on both sides of the body the same. Micturition was difficult for the first two or three days, the patient passing his water once daily, and after much persuasion. This condition was probably due to shock and his recumbent position. The bowels were constipated. The only mental change was in his temper: this could hardly have been worse; he grumbled at everything and everybody. This irascibility was quite abnormal, for he was well known as a man of great amiability and very popular with his regiment; since his recovery to

health, the irascibility has completely gone and he is once more of a charming amiability. The fragments of bone were removed and the whole cavity was thoroughly cleaned with one to forty carbolic lotion. By the help of a teaspoon the brain matter was removed, and then this huge cavity was packed with iodoform gauze from above downward; the gauze was passed up into the hole in the base of the skull and lightly pressed home. This hole provided excellent drainage, and to its presence is due the fact that no unfortunate complications ensued. Over this packing some layers of double cyanide gauze were placed, and then over the whole a hot mercuric fomentation, this being changed every six hours, the packing remaining in position for twenty-four hours. The wound of entrance was dressed in the usual manner by a small plug of iodoform gauze and a double cyanide dressing. The ear was packed with iodoform cotton-wool to keep it dry and clean. The right eye was carefully bathed with boric lotion and a little Pagenstecher's ointment put around the lids, as it was feared that the conjunctiva might become inflamed, since the eye could not be closed. Fluid diet was given and a large enema administered. The patient slept well during his first night, being utterly exhausted by his experiences. At the second dressing, twelve hours later, there was a good deal of disintegrated brain matter in the dressing, also some free in the wound above. The dressings were soaked in cerebrospinal fluid and in the lower part of the wound there was pus. More fragments of bone were removed. Dressings as before. The upper wound was doing well. The general condition of the patient was not quite so good as the day before: he was a little drowsy; temperature 99.4° F.; he was still perfectly conscious and sensible; pupils, respiration, pulse, etc., as before; temper dreadful. The next three daily dressings were similar in character to the last one, but less brain and much less cerebrospinal fluid had escaped each day. The drowsiness did not increase, the temperature became normal, and his general condition was excellent. We still took extreme care with his diet and the general quietness of his surroundings. On the fifth day the wound was granulating well; but across the upper part the hypoglossal nerve and occipital artery, which stretched across like a band, were very gray and sloughing in appearance and the occipital could be seen pulsating. We had all the necessaries for its ligation ready to use if hemorrhage occurred;

it was fortunate that this did not happen, as it would have been somewhat difficult to treat at the bottom of a deep hole in a bad light. From that date the wound began to contract with remarkable rapidity, the soft tissues of the neck coming together very nicely. The upper part of the wound was still bounded by its craggy bony walls; no granulation tissue grew from them, so that I fear some area of necrosis will occur in that region from the base of the skull, and perhaps from the ramus of the jaw. The wound of entrance healed in about a fortnight. The patient passed out of our hands after about a month's treatment; he was doing very well and has done well since. On leaving the Langman Hospital the wound had closed in its lower part, and the bony cavity was still packed above; the jaw was stiff and painful, but the patient could masticate soft solids and was eating full diet; the facial paralysis and deafness remained; there was no torticollis, although we had great difficulty in persuading the patient to vary his position so as to prevent it.

Remarks.—This case is interesting as showing what a grave amount of destruction the brain is able to sustain without losing any of its functions, and what an excellent thing a large hole for drainage is in brain cases; it is quite conceivable that a small hole would have been filled up, and then inflammation of membranes and brain ensuing would have caused excess of intracranial tension, producing compression or a hernia cerebri. The probable puncture of the ventricle and large amount of cerebrospinal fluid lost doubtless relieved excessive pressure. This seems to suggest that an enlargement of the skull wound and drainage into the ventricle might be successful in very bad cases of hernia cerebri. It is believed that a bullet traversing the brain practically pulpifies a large area of brain around it; recovery of this case proves that this area must be restricted, as the Rolandic area was absolutely unaffected, there being no paralysis or anæsthesia of the trunk or limbs.

Case II.—It was impossible to get any history of this case, as the patient, Private P., had lost his memory. He had been wounded in the right temporal region by a piece of shell; the wound was about half an inch above and behind the ear; there was a depressed fracture of the squamous portion of the temporal region, with signs of compression. The skull was trephined, portions of

bone being elevated and fragments removed; the dura mater was torn. The result after the operation was excellent: there was no paralysis of any part of the body, limbs, or face; the only sign of injury was his mental condition. The patient was a child in intellect: he understood what was said to him, but answered questions in a slow, dazed manner, only using the simplest words; he had forgotten everything; he did not know his name, his regiment, his regimental number, nor where he was. He lay quietly in bed, took his food well, slept well, and was apparently always thinking. Our greatest difficulty for the first few days was to make him micturate; this he had to be taught. He would not smoke, although he was a smoker. The sister of the tent and his fellow-patients were much amused by his child-like innocence. We instituted a system of education for him: taught him various common words and sayings; very soon he began to pick up words in conversation. We then taught him to write; this faculty returned quickly, so that at the end of three weeks he wrote me a letter which he proposed to send home; it was like that of a boy of eight or nine who has been but moderately well educated. At no time was there any paralysis or anæsthesia. He could understand ordinary conversation if simple words and slow articulation were employed. As time wore on he gradually began to assume the ordinary conversation and manners of a man, although his thoughts were quite child-like and his manner very modest. He left us, improving greatly, under the care of a friend.

Remarks.—This case is interesting as showing the effect of a shell-wound to be very similar to that of a punctured fracture, the result being quite localized. The Rolandic area was unaffected, but the centre for word-remembrance was probably a good deal injured (amnesia). The effect of education was most marked and pleasing.

Case III.—Private S. was admitted with a furrowed fracture of the right lateral aspect of the skull, which lay between two punctured bullet wounds. The wound of entrance was two and a half inches behind the external angular process and two inches above the zygoma. The wound of exit was two inches behind and on a level with the upper extremity of the ear. The wounds had healed when he was admitted into the Langman Hospital. On the skull could be felt the furrow in the bone with a raised ridge on either

side of it. The bullet had passed through the frontal, parietal, and squamous portions of the temporal bone, cutting a gutter in the external plate and diploe. He was admitted into the hospital a month after the wound. This patient had hemiplegia of the left side; when he was first admitted, the left arm and leg were absolutely paralyzed; the face was drawn slightly to the right, the facial muscles could perform their functions feebly; he could shut his eye, but could not close the lids tight; he could draw the angle of his mouth up or the lower lip down, but to a less extent than on the other side. The only muscles connected with the upper extremity which he could use were the pectorals, latissimus dorsi, and trapezius. He could flex his thigh on the abdomen, but could not otherwise move the limb. His mental condition was perfect; pupils, bladder, and rectum were normal. We persuaded him to do as much as he could with the paralyzed parts, giving him exercises which put into action the flexors and extensors of both arm and leg. In a few days there was marked improvement in his muscular powers: he could use his biceps and triceps in the arm, and similar muscles in his thigh. After five or six weeks the arm and leg had progressed so well that he could use all the muscles of his leg, even the extensors of the toes; and in the arm the only deficiency was that the extensors of the fingers did not move at all, but the extensors of his wrist were active. He practically worked all day long with various purposeless movements of the fingers, and at the end of two months he could pick up fine objects, button his clothes, and so on. The extensors of the fingers could now be seen to be contracting feebly, and by the help of the lumbricales and the interossei he had quite a useful hand. The face was quite normal. He left the hospital at this stage, being able to walk and to do what he required for himself with the hand. There is no reason why the extensors of the fingers and thumb should not recover perfectly.

Remarks.—This case is interesting as showing that, notwithstanding the large amount of fractured internal plate of the skull over the middle two-thirds of the Rolandic area, there was no necessity to operate upon the patient, although the Rolandic area must have been considerably damaged, probably from pressure of subarachnoid and subpial hemorrhage. The cortical cells on this side, and perhaps on the other side, were able to resume their functions

as the blood-clots shrank and began to be absorbed. It is marvellous that neither branch of the middle meningeal artery gave any trouble.

Case IV.—This man, aged thirty-four, was brought in the hospital train with Case I. He was wounded on October 12 about eight A.M. at Dalmanutha, and remained unconscious for twenty-four hours. On admission it was found that he had been shot through the right side of the skull; there had been considerable hemorrhage through the first field dressings. He lay with his eyes closed, taking no notice of his surroundings; he answered correctly to his name, regiment, regimental number, etc., but could not answer more involved questions. He complained of pain in the occipital region. This was about thirty-six hours after his injury. On examining the patient the wound of entrance was found in the middle of the right side of the skull, seven and a half centimetres from the external angular process and about seven centimetres above the Darwinian tubercle. The wound of exit was over the right eyebrow, opposite the middle supra-orbital arch, and four centimetres above the actual supra-orbital margin. The wounds were ordinary punctured wounds of the skull, bone being absent from the bottom of each. Loose brain matter in very small amount was protruding from both wounds, especially the wound of exit. There was no paralysis or anæsthesia; the right pupil was moderately dilated and reacted to light; pulse 60, full, strong; respiration normal; temperature 99.2° F. The wounds were dressed antiseptically. Next morning the patient presented the characteristic appearance of cerebral irritation: he lay curled up in bed on his left side, all his limbs strongly flexed on his body; he was very dull and stupid, answering questions in a slow, grumbling manner. Under the right conjunctiva in its upper part was a hemorrhage, both palpebral and ocular conjunctivæ being affected; pulse 60, full, strong; temperature 99° F.; no paralysis; respiration normal; still increased pain in occipital region. Nurse reported that he had been very restless during the night, and extremely difficult to keep in bed. The patient was now anæsthetized; the head was thoroughly cleansed; the anterior wound was opened up and the supra-orbital vessels were tied; a piece of the skull about one inch by half an inch which had been displaced upward under the scalp was removed, also other small, rough fragments of bone. The wound

in the skull now presented the appearance of an oblong hole or window, quite empty; no comminution of the internal plate could be seen; fissured fractures radiated from the hole in all directions. As there was no evidence of sepsis or intracranial tension, the wound was packed with gauze. The posterior wound was a smaller one and the fragment of bone removed from it was smaller and had been driven inward. A large amount of fissuring started from this window, which was also packed. From the direction of the fissures, the anterior and posterior fossæ of the skull must have been fissured to a large extent. Around both wounds was a great deal of subcutaneous hemorrhage. No more brain matter appeared in the wounds after the first small portions were removed. After this operation the patient did well. The cerebral irritation gradually died away in a fortnight, his restlessness being the chief trouble during the first week. The wounds did well, gradually healing from the bottom by granulation tissue. During the whole illness the pulse kept at 60, respirations were normal, and there was and is no trace of paralysis or anæsthesia.

Remarks.—The case is remarkable in that a bullet traversing the brain produced so little result. It crossed the whole frontal lobe and left by the lower part of the parietal; it must have pierced the corona radiata, but no paralysis could be detected. Again, the effect on the surrounding brain could not have been very great; it was probably a very close-range shot.

Case V.—Private A., aged thirty-one, of the Liverpool Regiment, was wounded at Ghiluk's farm, August 23. Two companies were advancing across a flat plain two thousand yards long; they lay down from 2 P.M. to 6.30 P.M., some big guns being on a kopje in their rear, two thousand Boers were intrenched within from twelve hundred and fifty to fifteen hundred yards of them. At 6.30 P.M. the two companies retired, and the patient was shot in the side by a close fire. He immediately fell down and lay for two hours, when he was taken into the ambulance wagon for three hours; he was then admitted into No. 8 Field Hospital for twenty-four hours; thirteen hours later he arrived at the Langman Hospital. We, therefore, received the patient about two days after he was shot. On admission the wound was found two inches external to the posterior inferior spine of the left os innominatum; there was no wound of exit. The wound was the ordinary small, clean

puncture of a Mauser bullet. Subsequently the Röntgen rays found the bullet in the right iliac fossa, deep down, probably embedded in the region of the sacro-iliac joint. The general condition of the patient was good, his mental condition perfect; but there was complete paralysis of the whole right lower extremity. The paralysis included all the muscles of the limb and those stretching from the trunk to the thigh. There was also anæsthesia of the limb, except in the area supplied by the external cutaneous, last dorsal, iliohypogastric, genitocrural, and ilio-inguinal nerves. The knee-jerks, plantar reflex, and ankle clonus were all absent. The left leg below the knee was paralyzed and completely anæsthetic. The patient could use the extensors and flexors of his knee-joint. The deep and superficial reflexes were absent. The patient said that immediately after he was shot both legs, from the abdomen downward, were quite useless and he did not know they were there. He complained of intense pain in the sacral and lower lumbar region, which kept him awake all night. He had no difficulty with micturition or defecation; there were no girdle pains or abdominal anæsthesia. At the end of the first week the patient could not use his paralyzed muscles any more than on admission, but the anæsthesia was less marked; there was some return of tactile sensation in both limbs. At the end of a fortnight the flexors of the right knee-joint, hamstrings, and adductors of the hip-joint were beginning to contract by the exercise of his volition; anæsthesia diminishing rapidly. At the end of three weeks the quadriceps, the hamstrings, and the extensors of the ankle-joint (flexors of toes) were capable of being contracted; anæsthesia practically gone. The tibialis anticus, the peroneus tertius, and the extensors of the toes did not recover contractile power at all. The peroneal muscles recovered later on, but the course of events in the left leg was similar to that in the right, except the important fact that he recovered power in all the muscles of this limb, including the extensor tibial group, at the seventh week; sensation was also perfectly recovered. The patient suffered considerable pain during this illness, at first in the back, and at the end of the first week in the thighs, calves, and ankles. At the end of the second month he complained of pain in the hip and ankle of the right side only; this pain was due to stiffness when he tried to walk. The only treatment he received consisted in massage and general diet. We had

no electrical apparatus on the veldt. There was very little wasting of muscles. On October 29, when he departed, the left leg was well, but rather weak; the right leg had recovered all its functions except the power of flexing the ankle and extending the toes, the muscles for which showed no contraction at all; the reflexes had returned in the left leg, but were absolutely absent in the right.

Remarks.—The Mauser bullet probably traversed the upper end of the sacral portion of the vertebral canal, causing concussion of the lower lumbar and sacral nerves, with hemorrhage into this confined space. Such concussion was recovered from, and as the blood-clot contracted and was absorbed the nerves resumed their functions, except the anterior tibial, derived from the fifth lumbar and the first and second sacral nerves, which supply the extensors of the left toes. There was no evidence of fracture of the bones in this region to indicate damage to the great sciatic as it leaves the great sacrosciatic foramen. The original lesion was an injury of the nerve either directly or by a spicule of bone.

TREATMENT OF ACUTE APPENDICITIS.

SPECIAL ARTICLE.

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One of the most difficult problems that the present-day practitioner of medicine has to meet is the treatment of acute appendicitis. The members of the medical profession generally recognize the affection as a surgical rather than a medical ailment, but cases are still found which baffle the skill of physicians and surgeons; there may be a serious doubt as to whether there should be some delay until the amelioration of the acuter symptoms makes operation more promising, or whether operation should be done at once in order to avoid serious complications. In recent years there has been a growing realization that an exploratory incision performed under favorable circumstances, need by no means involve the patient in great risk. Perhaps unnecessary abdominal operations are still done; patients are lost almost every day, however, who would surely have been saved by timely laparotomy. Delay may prove fatal, while premature surgical intervention seldom does harm. It seems clear that laparotomy should, as a rule, be counselled oftener than it is at the present moment.

This conclusion applies with peculiar force to gangrenous appendicitis. In this type of the disease the patient usually has no very serious constitutional symptoms, and there may be very little disturbance of the pulse and temperature. There is good reason for this failure of reaction on the part of the system. Tissues are dying because of disturbance of their blood supply, but as yet there is no absorption into the general circulation of such toxic material as would cause an elevation of temperature or an increase of the pulse rate by reason of its irritative effect upon the nerve-centres regulating these functions. Hence gangrene may occur while the patient seems to be in a very hopeful condition. Such

cases have given physicians and surgeons more occasions for unavailing regret than any others in the whole range of medicine and surgery. It is important, therefore, to take advantage of every suspicious symptom and to be ready to advise an exploratory laparotomy whenever localized symptoms point to an appendiceal condition, even though there may be no severe constitutional indications.

It is perhaps more important that this advice should be followed with regard to primary attacks of appendicitis than with regard to later recurrences of the symptoms. Primary appendicitis may be fulminant in type and take on an insidious gangrenous character that makes delay extremely dangerous. I am sure that very early intervention proved to be a life-saving measure in a recent series of cases; the gangrene was taking place at a time when no preliminary inflammatory reaction had secured the walling off of the appendix from the general peritoneal cavity, and consequently general peritonitis would surely have resulted from the gangrenous perforation which the operation showed to be imminent. These cases, of course, illustrate only one phase of appendicitis, but that one of great significance.

Case I.—The patient was a domestic, about forty years of age, at service in a well-to-do family. She complained at first simply of some pain in her right side. She was somewhat nervous, and this pain was not considered a very serious indication. It came on after a somewhat constipated condition had existed for a couple of days. An examination showed considerable tenderness in the right iliac region, though this was never very localized in character; after thirty-six hours of suffering, improvement in the general condition set in. The patient became much more comfortable, and the temperature, which had been only slightly above 100° F., with a pulse of 90, began to fall. The improvement was so marked at three P.M. of the second day that the attending physician regarded the condition as one of simple catarrhal appendicitis, and concluded that all danger was past. At eleven P.M. of the same day the physician made a visit of assurance and found the patient's condition very satisfactory. The temperature was about normal and the pulse very little, if at all, disturbed. As he was leaving the house, however, after having made his professional call, he was startled by a cry from the sick-room and was called back to see his

patient, who had taken a sudden turn for the worse. He found her suffering from an incipient chill, and after a very short time the temperature and pulse began to go up alarmingly. I was asked to see the patient in consultation at once. The sudden development of these secondary symptoms pointed to some radical change of the pathological conditions, and it was agreed that the patient was probably suffering from gangrenous appendicitis. There was no history in the case of previous attacks of pain referred to the right iliac region and nothing in the history that in any way resembled recurrent appendicitis.

After proper surgical preparation the operation was performed three hours later, or about two o'clock in the morning. The appendix was found lying to the outer side of and below the cæcum. The organ was twisted and bent sharply upon itself at the proximal end of its middle third. The circulation in the distal portion of the organ was evidently completely interrupted. Beyond the kink the appendiceal tissues were black and gangrenous, and perforation would evidently have occurred in a very short time. There were no adhesions in the neighborhood of the appendix, and nature had evidently not had sufficient time to take any precautions for the protection of the general peritoneal cavity against the infectious material that, without the operation, would very shortly have found its way out of the intestinal canal.

This case illustrates very forcibly the danger there may be in waiting, especially in primary attacks of appendicitis, unless the medical man and the surgeon in attendance realize the necessity for armed expectancy. The constitutional symptoms in this case would seemingly have justified waiting at least until the next morning in order to judge by the course of the case of the necessity and advisability of operative interference. Such a delay, with the idea that nature could be depended on to take care of the case for some hours at least, would almost surely have resulted in the death of the patient. This is, moreover, not a very unusual case, but, on the contrary, is a type of the gangrenous appendicitis that is so often fatal.

Case II.—The second patient suffering from gangrenous appendicitis came under my care within three days after the operation in the case already described. She was a well-to-do woman of the upper middle class, about thirty-five years of age, who had suffered

for about forty-eight hours from diarrhœa without any apparent cause. The night before the attack came on she had gone to bed in perfect health. On awakening in the morning, there was an uncomfortable sensation in her right side, which she described as a lame feeling. There was no pain, however, at this time. After breakfast she went out to make a call, and during the call was taken with a violent pain low down on the right side of the abdomen. She immediately went home, and after remaining in bed for several hours the pain subsided. Shortly after noon she went out to make another call, feeling perfectly well, but the exercise of walking brought on the same kind of pain as in the morning, only much more severe. On the way home this pain became so violent that she could scarcely walk. After getting to bed she suffered from nausea for several hours and was very restless and generally uncomfortable.

A physician who was called found her pulse and temperature both normal, and the only symptom an acute pain on the right side localized over the region of the appendix and accompanied by considerable tenderness. He considered it advisable to have a consultation with a surgeon. The presence of the pain seemed to point to appendicitis, but the symptoms seemed not to justify an operation. I suggested that leucocyte counts should be made, and the first one showed the presence of distinct leucocytosis, there being thirteen thousand white blood-cells to the cubic millimetre. After about six hours another count was made, when an increased leucocytosis—to the extent of seventeen thousand white blood-cells to the cubic millimetre—was found. At this time the patient's pulse was under 75 and the temperature was not above 99.2° F. The presence of the leucocytosis and its marked increase in a few hours seemed to indicate the existence of some serious and progressive infectious or gangrenous condition. Taken together with the pain and tenderness, this symptom appeared to furnish ample justification for at least an exploratory incision. At the operation an appendix was found which was gangrenous at its base and distended with serum and covered with inflammatory lymphoid exudation. This was removed and the patient made a good recovery. In this case, as in the preceding one, nature had as yet not had time to throw out sufficient lymphoid material to cause the formation of such adhesions as might save the general

peritoneal cavity from the infection following the inevitable perforation of the appendix. Virulently infectious material from the intestines would have set up an acute general peritonitis, with almost certain fatal termination.

Here, as in the previous case, there was no history of preceding attacks of pain or even of discomfort in the appendiceal region. The affection was evidently of an insidious but fulminant character, with practically nothing to call attention to the serious condition that was developing. It is in these cases, of course, that unavailing regrets, because of the delay of surgical intervention, are most common. It seems clear that in certain of these cases the presence of leucocytosis may furnish a deciding diagnostic symptom that will encourage the surgeon to make at least an exploratory incision. It is possible that at times only a simple catarrhal condition, not necessarily requiring surgical interference, will be found; but, while no harm need result from the exploratory incision, many lives may be saved by prompt intervention.

There are certain symptoms that enable one to judge, to some extent, at least, of the presence of a severe inflammatory condition in the appendix during the early stages of appendicitis, when every bit of information is so precious. So long as the appendicitis is merely catarrhal and has not gone on to the extent of producing pathological changes in all the coats of the appendix, that organ may exhibit exquisite pain and may be tender to pressure immediately above it, but usually will not be sensitive to the movement of intestines in its neighborhood. Whenever I am called to make an examination in a case of suspected appendicitis, I always try the patient's sensation on the left side first. Usually there is no tenderness to pressure and no sensation of discomfort produced by even deep pressure over the left iliac fossa. A little later in the course of the appendicitis, however, when serious changes have taken place in the inflamed organ, pressure on the left side is apt to cause considerable discomfort. Even the movements of the abdominal organs caused by deep breathing are liable to produce this same effect upon the inflamed appendix. Coughing is so painful that the patient takes every possible precaution to avoid it, and sneezing causes agony. If the development of this tenderness to pressure even at a distance is noted as occurring during the course of a case of appendicitis, it furnishes sure evi-

dence that the inflammatory condition is not merely internal, but has affected the whole organ, and that there is consequently no little danger of interference with the blood supply of the appendix and the resultant development of either gangrene or acute infectious changes because of the lowering of resistive vitality.

It should be firmly impressed upon physicians that if patients, in whom the existence of appendicitis is suspected, are restless and generally uncomfortable, if they toss from side to side and are troubled by persistent nausea or by slight vomiting or if there is obstinate constipation and no passage even of flatus, then the case surely involves not a medical but a surgical condition, and a surgeon should be called in consultation. Under these circumstances the existence of a progressive leucocytosis or the development of tenderness by contrecoup when pressure is made upon the left side is sufficient to justify the performance of laparotomy. As a matter of proper precaution, practically every patient in which there has been something more than the mere passing discomfort of a mild catarrhal appendicitis should be examined by some one who is accustomed to operate upon these cases and who appreciates the significance of certain symptoms that occur very uniformly in operable cases. It is very hard to analyze exactly the details by which such experience enables one to realize that operation is necessary in one case and may not be necessary in another. All cases of appendicitis do not demand operation, but many lives will be saved if surgical experience is taken advantage of in the selection of cases that should undergo operation. The dangers of operation are scarcely to be compared with the risks that may have to be encountered from acute fulminant appendiceal conditions.

OSTEOMYELITIS OF THE UPPER SHAFT OF THE FEMUR; APPENDICITIS WITH ULCERATIVE CÆCITIS; GUNSHOT WOUND OF THE NECK; TUBERCULOUS ARTHRITIS OF THE ELBOW-JOINT; PLASTIC OPERATION ON THE RIGHT FOOT; ANTERIOR ARTHROTOMY; FRACTURE OF THE PATELLA; FRACTURE OF THE EXTERNAL CONDYLE OF THE HUMERUS; FRACTURE OF THE SHAFT OF THE FEMUR; VESICAL CALCULUS.[1]

A SURGICAL CLINIC.

BY N. SENN, M.D., Ph.D., LL.D.,

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OSTEOMYELITIS OF THE UPPER SHAFT OF THE FEMUR.

GENTLEMEN,—On this case, you will remember, I recently performed a late operation for an acute attack of osteomyelitis involving the upper part of the shaft of the femur. A large osteomyelitic abscess was opened and drained. But pockets formed, the temperature rose, and the constitutional disturbance indicated the retention of osteomyelitic products, necessitating freer drainage. I then opened another abscess-cavity over the outer aspect of the thigh, cutting as near as I could through the intermuscular septum, with prompt improvement. A few days ago, contrary to our expectations, the temperature again rose, and the boy showed corresponding constitutional symptoms pointing to progressive sepsis. A swelling developed in the region of the hip-joint. It is one of those rare cases of very late joint complication. I made in this instance, three or four days after the initiation of the first symptoms, an arthrotomy of the hip-joint, and it is well I did so. I made the Sayre incision, and as soon as I reached the capsule of the joint

[1] Stenographic report.

I found it distended, and after incising it freely a large quantity of synovial fluid, mixed with pus, escaped. It was a typical case of suppurative synovitis developing months after the original attack of osteomyelitis. I made thorough drainage of the hip-joint: entered the joint with a long pair of forceps, passed it between the head of the femur and the acetabulum, brought it out at a point corresponding to the inner margin of the sartorius muscle, when a counter-opening was established, thus making efficient thorough drainage. I hope that this early operative intervention for the suppurative complication of the hip-joint will prevent destruction of the function of the joint, although there is great probability of some stiffness, if not ankylosis, following. It is always a serious complication. But the only thing a surgeon can do under such circumstances is to follow the ordinary rules of modern surgery, and wherever he finds pus, when it is accessible, to reach it as soon as possible by means of an adequate incision and to establish free and efficient drainage. We have been washing out the joint-cavity daily with reliable, very safe, antiseptic solutions.

APPENDICITIS WITH ULCERATIVE CÆCITIS.

This patient you have seen on different occasions. He was brought to the clinic with a diagnosis of appendicitis, which was verified by a member of the class, but the appendicitis has pursued a rather anomalous course. We found in the right iliac fossa indications of a suppurative peritonitis of limited extent that yielded readily to conservative measures. But the temperature has not become normal. Since that time, at irregular intervals, there has been a sudden rise in temperature with correspondingly rapid pulse, and one of the conspicuous clinical features has been a diarrhœa somewhat difficult to control. In fact, it was a question whether in reality it was not a masked typhoid. But the Widal test yielded negative results. The question arose whether it might not be an acute intestinal tuberculosis, because the clinical evidence pointed distinctly to quite an extensive ulceration in the region of the cæcum and of the lower segment of the ileum. I have an idea that in this instance the appendix played a subordinate *rôle,* and that we have to deal largely with an ulcerative cæcitis, and we have reason to congratulate ourselves that no radical operation was ever performed. Gradually this patient is improving, and this ulcerative

process, when once fully under control, may ultimately give rise to remote consequences which will necessitate operative intervention for intestinal obstruction. As these ulcers heal, stenosis from cicatricial contraction is liable to occur. Hence we are careful in directing the diet of the patient and procuring for the diseased section of the bowel, as near as we can by diet and by the administration of remedial agents, a condition of physiological rest.

GUNSHOT WOUND OF THE NECK.

This little boy was admitted to the clinic six weeks ago for a gunshot wound of the neck. An operation was performed with a view to locating and removing the bullet. Nothing, however, was found except a small fragment of bone from the inferior maxilla. We lost no time after his admission in taking a skiagraph, which shows the bullet lodged against the body of the fourth cervical vertebra, hence in an anatomical locality very difficult and dangerous of access. We, therefore, have resorted in this instance, as we invariably do when we have such reliable diagnostic information as is furnished by the Röntgen rays, to the most conservative measures. The external wound has become infected; hence we have limited our attention to the infected part of the wound tract, and the infection has not yielded. The bullet remains in its original locality. The boy is able to move his head in all possible directions; the missile causes absolutely no difficulty of any kind; hence there is no indication for operative intervention. I informed the parents at the time that if the bullet carried with it infectious material or became the centre of an abscess later, it would be much safer to reach the abscess,—that is, it would in that instance be a retropharyngeal abscess; that no operation from the outside would be justifiable in following the track of the bullet; that in the event of abscess formation we should deal with the abscess, and we then, perhaps, might find and remove the bullet. The boy has made a rapid recovery; he is going home, and I am fully convinced that no complications need be expected,—that this bullet has become encysted and remains harmless in a very important and dangerous anatomical locality.

APPARATUS FOR FLAIL-JOINT FROM TUBERCULOUS ARTHRITIS.

This patient you will recognize as the one who has been coming to the clinic for a long time for an obstinate form of tuberculous

arthritis involving the elbow-joint that eventually necessitated a complete resection. A flail-joint has developed. I want to show you the little apparatus I have constructed, which will enable the patient to use his arm freely. It is very simple. It is a hollow, well-padded, posterior metallic splint, with an anterior splint for the forearm and for the arm, held in position with straps and buckles. Without this apparatus the arm, as it is now, is useless to the patient. He cannot extend it; he cannot even flex it. When I apply this apparatus the arm becomes serviceable to the patient. The hand is strong and he can do almost anything. This is what we do in such cases of false joints, where we have simply a lack of support on the part of the bones of the joint: I apply this apparatus instead of an external mechanical splint.

PLASTIC OPERATION ON THE RIGHT FOOT.

This is a case of Reverdin's skin-grafting recently performed in this clinic for the purpose of covering a large dorsal defect on the right foot, the result of an extensive crushing injury. In this little operation we took five Reverdin skin-grafts from the anterior surface of the thigh. At that time there was a large granulating surface remaining, which is now nearly paved over by new epidermis, and that has been proliferating by the different islets of epidermic tissue and from the margins of the granulating field. It shows the value of Reverdin's skin-grafting in expediting the process of healing of surface defects by granulation and cicatrization.

ANTERIOR ARTHROTOMY.

Here is a little girl with tuberculosis of the shoulder-joint. She has come to the clinic three times; but the disease seems to remain *in statu quo,* and unless I notice a decided improvement in the course of three or four days from now, I shall make an anterior arthrotomy and resect the capsule of the joint, and remove as much of the articular surfaces as have become secondarily involved by the tuberculous process.

FRACTURE OF THE PATELLA.

This is a case of fracture of the patella that has been treated in the clinic for the last seven weeks on a conservative plan, for reasons which I do not need to emphasize, because the surgeon who

invariably makes a plea for immediate operative intervention is a dangerous teacher, and such operations are occasionally, though not very often, followed by the most disastrous consequences. The skiagraph shows the line of fracture and the causes that were constantly interfering with bony union. You will notice that the lower fragment is tilted; that is, the fractured surfaces are not *vis-à-vis*. No amount of external mechanical pressure or any other device could bring the fractured surfaces into accurate contact and hold them in uninterrupted apposition, and that is a strong point made by MacEwen in favor of operative treatment. No support would be needed if I could have lifted the fragment forward and upward, and united the fascia covering in the patella; I would have accomplished all that was necessary to obtain ideal union by bony consolidation. But the knee-joint is a structure extremely susceptible to infection, and even in a well-regulated clinic, with all the facilities at our disposal, such operative intervention is not devoid of danger. We have done here what surgeons have been doing for centuries,—namely, have held these fragments in as close contact as possible with strips of adhesive plaster. I find the fragments are in very close contact. We have obtained union by the interposition of a short ligament, and that, according to the statement of the greatest authority on fractures this country has ever produced, Frank H. Hamilton, is equivalent to a bony union. I have now under observation an elderly person who, a number of years ago, fractured his patella. I can now place four fingers between the patellar fragments when the limb is slightly flexed, and yet he has good use of his limb. Just think of it! I propose, before this patient leaves the hospital, to have a skiagraph taken and to exhibit it to you, showing what nature can accomplish under the most adverse circumstances in the restoration of function of the knee-joint after a fracture of the patella. I am watching the patient carefully. We removed the splints a few days ago. If I should find in the near future any difficulty in promoting restoration of union, I shall have no hesitation in resorting to secondary suturing of the patella, a less dangerous procedure than primary suturing. We will see to what extent he can use the knee-joint. He is doing very well indeed.

One of the greatest masseurs of Amsterdam treats cases of fracture of the patella, without applying a splint or anything else, by massage, and claims most excellent results. Impaired function in a

case of fracture of the patella is as much the result of intra-articular disease as the remote result of the fracture itself. Hence in this instance the patella should be treated by massage; early, active, and passive motion should be resorted to temporarily for the purpose of restoring joint function. We shall show this patient again in the course of a week or two, and I am sure we may look for a satisfactory functional result.

FRACTURE OF THE EXTERNAL CONDYLE OF THE HUMERUS.

Here is the little child whom we had before us two days ago with fracture of the external condyle of the humerus. I have had the child brought into the clinic to show you the plan we have adopted for the purpose of keeping the fragments at rest and to prevent deformity, which constantly develops in all cases where such fractures are treated by bending the forearm at a right angle. That is dangerous. We have the forearm nearly straight, it is only slightly flexed and immobilized by a plastic splint, which fits the contour of the limb or surface accurately, so that there is no danger of necrosis or of any harmful pressure, and we have left out the tips of the fingers in order that we may judge day after day of the condition of the circulation of the limb.

FRACTURE OF THE SHAFT OF THE FEMUR.

I will pass around three skiagraphs which illustrate a fracture that I wish to make a few remarks upon this afternoon.

This patient sustained a fracture of the shaft of the femur near its middle some nine months ago. This [pointing to the picture in hand] was the skiagraph brought by him when he entered the hospital. He was admitted seven months after the injury occurred, with overlapping and angular deformity. We had to face a serious question, owing to the length of time that had intervened between the injury and the admittance of the patient into the hospital, and owing also to the fact that absolutely no union had occurred. The question arose whether I could not at once resort to measures to vivify and fix the fragments by direct means. I made extended remarks at the time, and finally concluded to give the patient another chance by resorting to conservative measures. Comparative measurements showed three inches of shortening. We then applied the usual Buck apparatus, aided by Volkmann's railway slide. I

would like to have you notice once more this apparatus, which is for the purpose of preventing rotary displacement. We have made these comparative measurements a number of times since, and now, at the end of about two and a half months of vigorous extension by applying twenty-five pounds of weight, we have reduced the shortening to three-quarters of an inch. I have compared the skiagraph taken here a number of weeks after the admittance of the patient, who was treated on the plan I have just outlined, with the one prepared yesterday, and the latter shows still further improvement. The overlapping has been almost overcome. There was complete overlapping in the first skiagraph, which was not corrected in the second one. But here we have apposition over a considerable extent of the fractured surfaces, and it looks as though between the fractured surfaces held in contact bony union is taking place. It is this part of the result that I wish to investigate a little more thoroughly to-day. I want to show you this ideal apparatus. Its extension is perfect. The adhesive straps are properly applied; the limb is immobilized upon Volkmann's splint; the wheel is placed in its proper position, and an adequate weight is used for the purpose of overcoming the shortening.

Recently, recognizing the danger of non-union under such circumstances, I resorted to a local measure calculated to expedite the osteogenetic process, and demonstrated to you the application of Helferich's method, which consists in making circular elastic constriction above and below the seat of fracture. That has been done for the last three or four weeks. These elastic bands I have tightened a little more, so that now there is marked swelling or œdema between the points of elastic constriction, consequently increased blood supply to the seat of injury, improvement in the nutritive conditions about the seat of fracture best calculated to expedite bony consolidation. When I examined the seat of fracture at the time of the patient's admittance to the hospital, provisional callus seemed to be entirely absent. It is mutual contact between broken surfaces that does so much in exciting bone production. We have reached that stage now. Part of these fractured surfaces is in contact, and it is a mutual contact best calculated to expedite the process of repair.

I will see to what extent union has taken place. I will rotate the limb. If union has occurred, the great trochanter will rotate;

if it has not, it will remain stationary. I find the great trochanter rotates, so that we have obtained quite firm union, and I trust it is bony union. This test is reliable. The other test is to place my hand underneath the seat of fracture, lift now the thigh, and I find no angularity. So I think we have the consolation of knowing that the treatment we have persistently carried out for the last three months has finally resulted in partial, if not complete, bony consolidation, in a case of delayed union for eight months.

VESICAL CALCULUS.

This is a case of stone in the bladder, on which I shall perform a suprapubic cystotomy. Through the very careful anatomical investigations of Peterson and John B. Roberts, of Philadelphia, this operation came into prominence some fifteen years ago, and now threatens to displace nearly all other procedures, including the crushing of the stone. Anatomically it is a most perfect procedure; clinically it yields the most satisfactory results. It is seldom that the modern surgeon resorts to the perineal route, either in the form of a median section, simply cutting the urethra in the median line, enlarging the prostatic portion and removing small stones, or performing the typical Chesterton operation or the bilateral. The modern surgeon, in cutting for stone, with very few exceptions selects this high operation, the suprapubic incision or sectio alba. We owe it to Peterson, who improved the technic of the old suprapubic operation. What made the earlier operation so undesirable and brought it into disuse was the fact that the surgeon very often unintentionally opened the peritoneal cavity, and consequently death frequently ensued as the result of a diffuse peritonitis. Peterson improved the technic in enlarging the extraperitoneal anterior portion of the bladder wall by distention of the bladder, raising the organ out of the pelvis, lifting it forward, and bringing it into easy reach by means of his rectal bulb, or rectal balloon, or rectal colpeurynter.

This subject was very carefully studied anatomically right here in this amphitheatre by the late Dr. Albert B. Strong, then demonstrator of anatomy under Professor Parkes. He made some beautiful dissections, and his work added much to the improvement of the technic of this operation. He repeatedly demonstrated the value of vesical distention and dilatation of the rectum by the balloon in

bringing the part of the bladder involved in the operation into a safe location. In enlarging temporarily the cavity of Retzius, the extraperitoneal part of the anterior wall of the bladder is carried in an upward direction. Some surgeons do not make use of this expedient. The late Lawson Tait, the noted gynæcologist, who occasionally transgressed the rule and operated on the opposite sex, had no use for bladder dilatation and therefore never resorted to the rectal bulb. His dexterous finger safely found its way through the space of Retzius into the bladder, and through that pathway extracted the stone. This requires great dexterity and the utmost care, therefore placing that route under a disadvantage, favoring subsequent infection. For this reason the modern surgeon is only too anxious to adopt the improvement in the operation by enlarging the cavity of Retzius by the mechanical means I have just mentioned.

It is, however, necessary to exercise great care in making use of these expedients, because serious accidents have happened. For instance, overdistention of the rectum has resulted in atony and loss of the action of the sphincter; also escape of the bulb into the abdomen, the patient dying of septic peritonitis. Over-distention must be carefully guarded against; hence the necessity of using measured quantities of air or fluid for the purpose of distending either the bladder or the rectum. Thirteen ounces of water is the amount to be used for distending the bladder moderately and for filling the rectal bulb. By going beyond this amount there is great danger of doing damage to either of the organs distended.

We have inserted an ordinary elastic catheter, through which thirteen ounces of fluid or an equivalent amount of air will now be injected. I prefer to use a watery solution, because on opening the bladder the sudden gush of the fluid will oftentimes materially aid in bringing the stone forward within easy reach.

This man has been operated upon before: years ago two stones were removed from his bladder by the perineal route. He has grown old since then, and another very distressing pathological condition has set in, complicating the presence of stone in the bladder. He has an enlarged prostate, which adds materially to the vesical distress and also influences us now in choosing the suprapubic route in preference to the perineal. For three or four years after the operation his bladder was at perfect ease. Symptoms then

again slowly developed, reproducing the same clinical picture; consequently I was suspicious of the presence of a stone in the bladder. The coexistence of the enlarged prostate made it necessary to make a probable differential diagnosis between obstructive prostatic disease and vesical calculus. When the patient came to us a few days ago, I failed to find the stone with the sound. Not wishing to punish him too much immediately upon his admission to the hospital, I waited for a few days and made another examination yesterday with an instrument of special construction. With Thompson's searcher I had no difficulty in finding the stone. It lay behind the enlarged prostate; that is why I could not find it with the ordinary sound, and why I could not elucidate that satisfactory click, so interesting in a surgical amphitheatre. The only way in which I could touch the stone was by turning the bit of the instrument backward against it.

The distinguished Professor Nussbaum always insisted that no surgeon, no matter how skilful, should trust solely to himself in determining the absence or presence of stone in the bladder. So, whenever he was about to operate for vesical calculus, he invariably called a colleague to share the responsibility with him. I, therefore, availed myself of the assistants, and I believe two or three of them felt the stone. They were satisfied that the bit of the instrument came in contact with a smooth, hard surface.

The suprapubic operation gives a much better opportunity for digital exploration of the entire interior of the bladder, especially in cases of prostatic enlargement. Our patient's bladder is now distended, and I can feel the fundus half-way between the pubic bone and the umbilicus. It is distended just about right. The rectal bulb will next be inserted and we shall inject into it twelve ounces of fluid, so that the distended rectum will lift the bladder forward and make it more accessible.

I shall perform the ordinary suprapubic cystotomy. If the stone should be very large, surgeons now, for the purpose of gaining more ready access to it and procuring a more adequate route for its extraction, make Bardenhauer's transverse incision, dividing the insertion of both recti muscles. This opens the upper vesical space well, and after the operation the muscles can again be sutured to the point of attachment. Under ordinary circumstances, for the removal of a stone of moderate size, a vertical incision is all that

is required. It becomes necessary now to rely upon certain anatomical landmarks in making the incision. It is made as nearly as possible in the median line, cutting through the linea alba and down to the symphysis pubis. That will, of course, be the limit of the lower end of the incision. I shall begin the incision about three inches above the pubes, cutting through the skin and the connective and adipose tissues immediately beneath it. We have now cut through the panniculus adiposus. I will next incise the muscular part of the abdominal wall exactly in the median line and to a lesser extent than the external ring; this incision is carried down to the bone. Having cut through the muscular layers of the abdominal wall, I enlarge the opening by stretching, so as to take no risk whatever of opening the peritoneal cavity above. I have now reached the upper vesical space. There is an incision about two inches in length through the deeper portions of the abdominal wall. There is very little hemorrhage. Now I will cut away a little of this prevesical fat in order to expose the underlying anterior wall of the bladder. In doing this I am careful to avoid vessels of any considerable size. We cut here a few of the fibres of the recti muscles so as to get a little better access to the prevesical space. I pick up the prevesical fat and cut it away at the point where I shall make the bladder incision.

I have exposed the bladder very satisfactorily, and with the bullet-forceps we can now fix the bladder wall when we are ready to make the incision into the viscus. I cut from above down, the back of the knife being directed upward, and I use my left index-finger as a guide, pushing up the peritoneum so that there will be no chance whatever of accidentally wounding it. I have made an opening about an inch in length between the nail of the index-finger and the symphysis pubis. Having made the incision, I at once follow it with the index-finger. I can feel an enormously enlarged prostate and a small stone. I will grasp the bladder wall a little more effectually with the hæmostatic forceps. I have already located at least two stones, if not more. Here is one having facets, a fact sufficient in itself to indicate the presence of other calculi. I use my finger like a scoop, as I do not wish to use forceps. Here is another, and a third; still another, and yet another. These stones were all lodged behind a wall made by the enlarged prostate. The crushing of stones in such a position would be difficult.

I am sure that I have removed all the stones, and there is nothing left now except the projecting portion of the prostate. I will improve the opportunity and dilate the prostatic portion of the urethra a little with my finger. The operation is now completed.

I operated on this man for the purpose of removing the stones, but he is the subject of a very severe cystitis, produced by the mechanical obstruction incident to the presence of the enlarged prostate as well as to the former presence of stones. This bladder, therefore, requires absolute rest and local antiseptic treatment. To make this treatment easy and efficient, we shall now drain the bladder until we are satisfied that the cystitis is under control.

I want to show you this little drainage-tube that I have devised. It has answered a most excellent purpose in cases requiring long or permanent drainage. It is shaped like the letter S. It is a self-retaining catheter; nothing can dislodge it: perhaps the only objection which can be raised is that it is difficult to remove it. In order to overcome this objection, I have been continually reducing the size of the bulb on the end of it. I have more than once been thrown into violent perspiration by efforts to remove the catheter. It is very hard to do this, especially in old fistulas, where the tube is grasped by firm connective tissue.

You notice that I still have my finger in the bladder; it serves as a guide for inserting the tube. You will be astonished to learn how easily such a wound in the bladder is lost, so that unless you have your finger in it you may experience some difficulty in finding the incision. Keep your finger in the opening until the entire operation is completed. I make the insertion of the finger by grasping the margin of the vesical wound, drawing it forward with the hæmostatic forceps, and in that way I had no difficulty in finding the opening. Otherwise such an opening is very easily obscured, and an immense amount of harm has followed attempts to find it.

A piece of rubber tubing has been attached to this S-tube, the end of which will be placed in a vessel beside the patient. With my finger I enlarge the wound somewhat and insert the catheter until it reaches the neck of the bladder. What a terrible thing would happen if I should lose the opening and push the tube into the anterior bladder wall! I keep the finger well in place, therefore, until the tube has reached the neck of the bladder. I then turn the instrument and it is in place.

The most sensitive portion of the bladder is the neck. Touch it and it is like touching an electric button. The base of the bladder is almost without sensation, and it is for this reason that in prolonged drainage a tube must be used that is away from the neck of the viscus, and that is one of the virtues of this tube. The end is now above the prostate, away from the vesical neck. I believe that attempts to bring the bladder forward to enable suturing, do more harm than good.

I shall keep this wound open for a sufficient length of time to treat the suppurative cystitis by local medication. You will find that in the majority of cases requiring cystotomy, suprapubic or peritoneal, there is another indication to fulfil, and that is to combat the cystitis, requiring efficient drainage and patency of the wound. I will now ask the assistant to wash the bladder with a boric acid solution to cleanse it of blood that may have accumulated. I had hoped to be able to show you in connection with this case that fluids can be introduced into the bladder without a catheter,—tubeless irrigation of the bladder. Occasionally it fails. The hand is the best clinical thermometer for estimating the temperature of fluid to be used. I insert the glass tube of the irrigator into the rubber catheter, and you will see how quickly the fluid escapes and how nicely this bladder can be washed out without causing any pain to the patient.

The wound is now in a proper condition for our dressing. I pack the cavity of Retzius around the tube with one long strip of iodoform gauze; I say one strip because if we use more than one we might lose it in the depth of the wound. I want one long strip, and then there will be absolutely no chance of overlooking, losing, or forgetting it. Many suits for damages have been instituted against physicians for leaving gauze or sponges in a wound. These accidents have happened to the best of surgeons. They happen in hospitals as well as in private practice. I therefore lay much stress upon packing the wound so that there will be absolutely no chance for such accident occurring. I first pack below, down to the bladder wall, then I pack one side, and now I pack above, pressing the tube down a little to be sure that it remains in the bladder. I have packed right under the peritoneal reflexes. I now pack on the opposite side in the same manner. This gauze is one drain; the little tube drains the bladder. That is one advantage of this pack-

ing. The more important object is to protect the loose connective and adipose tissues in the cavity of Retzius against infection from the invading urine and from the wound surface. Occasionally one of this class of patients dies from progressive phlegmonous inflammation involving the cavity of Retzius, and finally both sides of the bladder undermining. For this reason we are just as careful in dressing these wounds as we would be in dressing a wound of the abdominal cavity or elsewhere.

I now wind this gauze around the end of the sigmoid, self-retaining catheter, at the same time packing the lower angle of the wound. The gauze we will secure with a safety-pin. Now I shall pack the upper angle of the wound—that is, as much as will remain after inserting one stitch—with another small piece of gauze. I can put in one suture here and diminish the upper angle of the wound.

I want this patient to receive, as soon as he is in bed and has recovered from the effects of the anæsthetic, fifteen grains of quinine bisulphate in two ounces of warm water, per rectum. We will add to that two ounces of spirits, as the patient is somewhat debilitated from prolonged suffering. He is marasmic and needs stimulating, and that is best done by rectal enemas. We will apply hot packs to the extremities, in order to restore peripheral circulation, because occasionally suppression of urine occurs in these cases. We will irrigate the bladder once or twice daily, the fluid being introduced in the manner you have witnessed. The piece of gauze in the upper angle of the wound can be removed in the course of two or three days, but the deep packing will remain for at least one week unless indications arise requiring its removal.

Obstetrics and Gynæcology

NEPHRECTOMY; PANHYSTERO-MYOMECTOMY, WITH DOUBLE SALPINGO-OOPHORECTOMY AND APPENDICECTOMY; FIXATION OF RIGHT KIDNEY; SUSPENSION OF UTERUS, WITH RESECTION OF A CORPUS-LUTEUM HÆMATOMA; SALPINGO-OOPHORECTOMY, FOLLOWED BY RESECTION OF THE SIGMOID FOR CARCINOMA.

REPORT, BY DR. GUY L. HUNNER, OF THE GYNÆCOLOGICAL CLINIC AT THE JOHNS HOPKINS HOSPITAL, BALTIMORE, MARYLAND.

BY H. A. KELLY, A.M., M.D.,

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NEPHRECTOMY.

GENTLEMEN,—We never like to see our former patients return for further operative treatment. But trials for one patient may prove blessings for another; our most valuable lessons are often learned at the autopsy or in the performance of a second operation, when we have an opportunity to observe the results of former treatment.

Our greatest advances in the past four years have been in work upon the urinary system. For this reason I am particularly glad to show you the results in this case. The patient is fifty years of age, has been married fourteen years, and has never been pregnant. She was first admitted to the hospital one year ago, when she gave a history of illness for fourteen years. For eight years she has had, about once a year, attacks beginning in the epigastrium and radiating to the lower abdomen. These spells were marked by persistent vomiting, and generally there were chills. During the seizures there was partial suppression of urine; she was never jaundiced. More recently the attacks changed in character. The pain began

as formerly in the epigastrium and spread to the lower abdomen; in addition it was felt in the right kidney region and shot up to the right shoulder. It never radiated into the right groin, but was sometimes felt on the inner side of the thighs. She has always voided urine frequently, but never noticed blood in it. During the attacks, or soon after, she has at times had extreme urethral pain in micturition. A year ago she noticed much "pus" in the urine. This was a fairly clear history of stone in the right kidney, and the diagnosis was confirmed by the use of the wax-tipped renal catheter and by the X-rays, the latter showing the stone to be very large.

I operated April 6, 1901, removing a stone which weighed two hundred and forty-five grammes. Fig. 1 will give you an excellent idea of its size and form. Figs. 2 and 3 show the incision made at that operation. You see it is posterior to the lateral convex border of the kidney and extends through the posterior pyramids. This incision, as Mr. Brödel has shown by his beautiful anatomical injections, is the least bloody that can be made. It enters the pelvis of the kidney through the plane of meeting of the anterior and posterior vascular systems, and therefore at the greatest distance from the main vascular trunks. I was materially assisted in locating the lobules by distending the pelvis by means of a gravity apparatus attached to a renal catheter which had been inserted through the cystoscope before the operation.

The kidney was closed with square sutures passed through the entire mass at about the periphery of the pelvis and then back one centimetre distant and tied on the side of entry. Such sutures compress the kidney in a firm manner and prevent active bleeding. An iodoform-gauze drain was left down to the kidney to carry off the urine and blood that might ooze from the incision during the first few hours after operation. The patient was discharged thirty-three days after the operation, feeling perfectly well and with the lumbar incision entirely healed. She remained well and gained in flesh and strength until ten weeks ago, when she had another fairly definite attack of pain in the kidney region; and since then she has had almost constant discomfort and has passed a great deal of "white, stringy material" in the urine. The X-rays now show an indefinite picture, which does not help us to differentiate between a stone and a kidney with some degenerative process. The

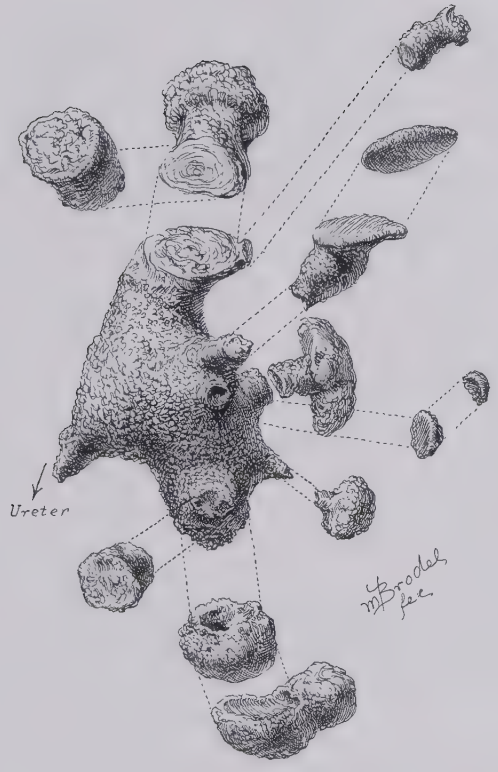

FIG. 1.—Stones removed from right kidney of Mrs. M. H. Note the cup-like base of a broken fragment on the posterior face, near the centre of the large stone. The calyx portion was probably left, and may have given rise to the abscess found at the second operation.

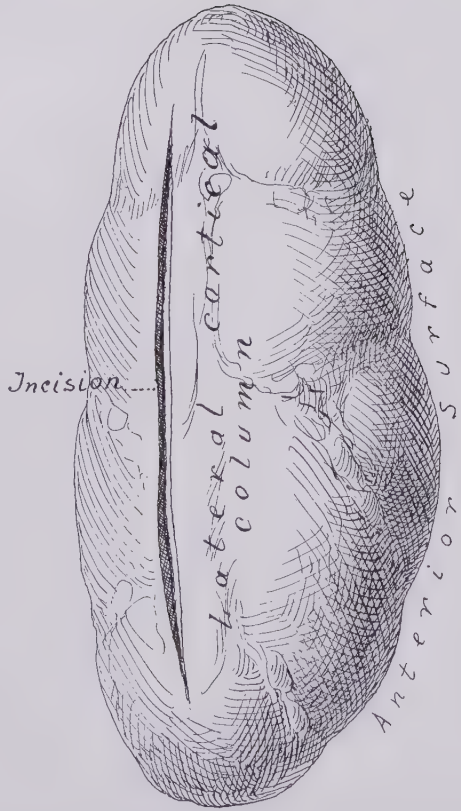

FIG. 2.—Situation of incision in kidney in order to reduce amount of hemorrhage as much as possible.

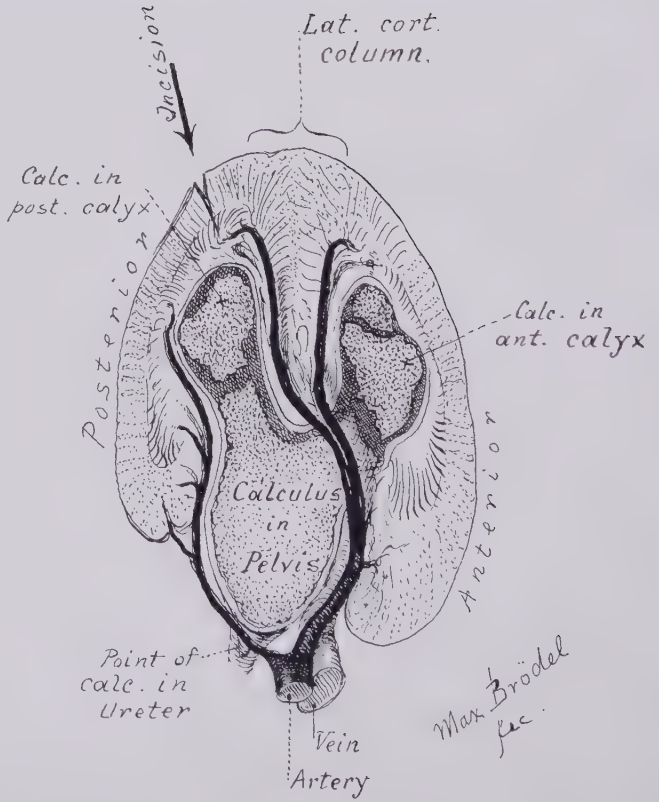

FIG. 3.—Transverse section of kidney showing situation of stone.

wax-tipped bougie, however, has shown slight but definite scratch marks on two occasions.

I am prepared to-day to remove any calcareous material that may be encountered, and to save the kidney if it be in good condition; but, if it prove to be badly diseased, it will be removed. We have ascertained the condition of the left kidney, and will not hesitate to remove the diseased side if it threatens to keep the patient an invalid. By holding a speculum under the left ureteral orifice, enough urine was caught to make a microscopical examination, and was found to be clear. Then the diseased side was catheterized and the patient allowed to change from the knee-breast to the dorsal position. The bladder was washed and emptied, in order that the urine caught for the next half-hour should represent that from the good kidney, the catheter bringing down urine from the diseased side during the same time. In this manner we find that the left kidney is secreting twice the amount that comes from the right, and that its urea value, as shown by cryoscopy, is double that of the diseased side. The former operation was done through a gridiron incision, and, as I follow the same line to-day, the different muscles can be seen in their normal positions. My assistant retracts the border of the latissimus dorsi, and as I retract the border of the external oblique you plainly see the fascia of Petit's triangle. I formerly made the fascial incision through this triangle, but I now reach the kidney through the superior lumbar triangle.

The degree of fixation of this kidney is interesting to note. Of course, the wound was an infected one at the last operation, and a gauze drain was inserted to the kidney cortex. The adhesions are now so dense that I dare not loosen the kidney by blunt finger dissection, for fear of tearing out bits of its cortex. I use blunt scissors to cut its adhesions from the posterior abdominal wall and from the peritoneum anteriorly. As the kidney is brought up out of the wound you plainly see the depressed scar of the former operation and the adherent perirenal fat (Fig. 4). I again open it in this line, and on palpation I feel no stone. Here in its lower pole is a small abscess, and, as you see, there is a thickened inflammatory condition of the renal pelvis, while its surface is studded with irregular groups of small cysts. Although the kidney is not much smaller than normal, there is considerable fibrous degenera-

tion, resulting in atrophy of the parenchyma (Fig. 5). You see from the drawing of the former stone that its smaller branches reached far into the minuter calices, and it is only reasonable to suppose that some of its fragments were left behind. This small abscess in the lower pole probably has a fragment of stone as its foundation. In view of the fact that she has one normal kidney and is liable to trouble if this diseased kidney be returned, I shall do nephrectomy. By bluntly pushing down this fat about the pelvis, I expose the vessels individually, using No. 4 silk for the large arterial branches and No. 3 catgut for the veins and to reinforce the arterial ligatures. The ureter is tied with catgut and dropped, and a small gauze drain is inserted because of the infection. On searching the pelvis and calices very carefully after removal of the kidney, we find two flat fragments of stone, which are too small to make an X-ray shadow through such a fibrous kidney. This finding suggests that in these cases with widely branching stones the kidney should not be closed, but should have a large drain inserted to its pelvis to give free escape for such calculous particles. It is impossible to be sure that the calices are all cleared of stone at the first operation; these small fragments have a tendency to be thrown into the pelvis later, and should be given an opportunity to escape.

PANHYSTERO-MYOMECTOMY; DOUBLE SALPINGO-OOPHORECTOMY; APPENDICECTOMY.

You are fortunate in again seeing the ultimate result of a former operation. The aim of the gynæcologist should be the relief of suffering with as little mutilation and as great conservation of the organs as possible. Fibroid tumors of the uterus have given us the greatest satisfaction as a field for conservation. In this clinic we have performed myomectomy on two hundred and thirty-seven cases. There have been six deaths after the operation, and this is the second patient who has returned for a second operation for myoma. Of the two hundred and thirty-seven cases, one hundred and eighty-four were done abdominally and three deaths followed, —one due to pneumonia, one to intestinal obstruction, and one to general peritonitis through infection from an unsuspected carcinoma of the uterine cavity. Of the three deaths following vaginal myomectomy, one was due to hemorrhage, and two were probably

FIG. 4.—Kidney of Mrs. M. H., showing the scar of the former operation and perirenal fat

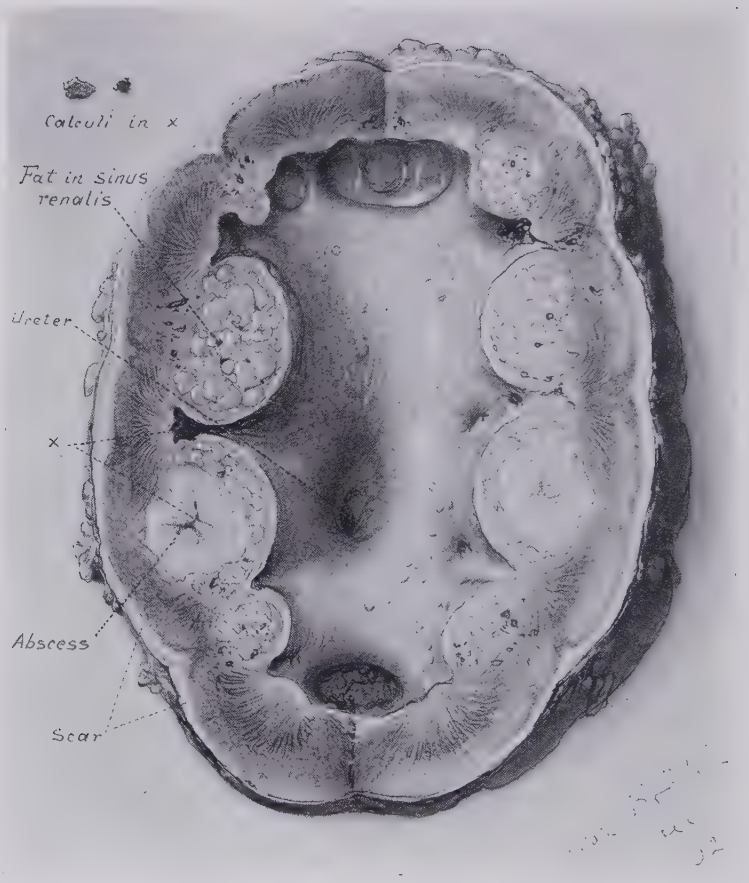

FIG. 5.—Kidney of Mrs. M. H. laid open by longitudinal incision, showing situation of small calculi, abscess, and scar of former operation.

from sepsis, the patients being in extremely bad condition before the operation for sloughing myoma was undertaken.

This patient is forty-eight years of age, unmarried, and has menstruated regularly until within a few months. She first presented herself five years ago, complaining of a gradually increasing tumor within the abdomen. I removed an immense myoma from the anterior wall of the uterus; its measurements were twenty-five by twenty-one by nine centimetres. After shelling out the tumor, the excess of uterine wall forming two large flaps was trimmed down, and the wound in the wall was closed with several layers of catgut, beginning in the floor of the wound to prevent all dead space and hemorrhage. In my "Operative Gynæcology" (Vol. ii. p. 356) you will find a drawing to illustrate the large tumor-like mass formed by the fundus at the close of that operation. (See Fig. 6.) The patient was discharged well on the twentieth day, and has been in good health since, coming to me again only because she discovered another mass in the abdomen. On examination, I found a mass posterior to the uterus and another extending into the right inguinal region. These masses, with the uterus, seemed fixed in the pelvis, and I feared sarcoma. But under anæsthesia we find the uterus, with its two masses, to be freely movable, and these masses have the feeling of myomata.

On exposing the pelvic contents, you see this long white scar on the left anterior wall of the fundus (Fig. 7), marking the site of the former tumor. This myoma in the region of the right cornu gives the entire mass somewhat the appearance of an enlarged bicornute uterus. I now tie the ovarian and round-ligament vessels on each side, and, cutting these structures, enter the broad-ligament folds and secure the uterine vessels. Cutting these, their stumps are pushed down and the vaginal vault is exposed. Entering the vagina on the left, I quickly ring it close to the cervix, and remove the entire uterus with its tumors and the lateral structures, thus preventing the possibility of further myoma development. The vaginal vault is closed with interrupted catgut sutures, and the entire raw area of the pelvic floor is covered by peritoneum.

As a routine after such pelvic operations, we examine the upper abdominal organs—particularly the gall-bladder—and then the appendix. This appendix has two circular constrictions in its walls

and the distal constriction bounds a bulbous end. The walls are thickened and there has undoubtedly been an inflammatory process at some past time. I encircle the base of the appendix with a purse-string suture of silk. Clamping the appendix about fifteen millimetres from its base, I cut distally to the clamp and tuck the long stump into the cæcum. As the purse-string is tightened the clamp is withdrawn. Two mattress sutures of silk effectually cover the base with cæcal wall. The abdominal wall is closed in layers with catgut sutures.

FIXATION OF THE RIGHT KIDNEY.

This case presents a feature which, so far as I know, is unique. The patient is twenty years of age and unmarried; she has complained of aching and a weak feeling in the right side of her back since she was fourteen. At that time she fell from a horse and has been a semi-invalid ever since. In addition to the almost constant aching, she has occasional sharp attacks of pain in the right side, particularly after exertion and at the time of her menstrual periods. She does not seem to have had a paroxysm that could be called a Dietl's crisis. She never had disturbances of micturition nor has she noticed blood in the urine.

When the patient first came to me in December, the routine examination of her urine showed a distinct trace of albumin and the presence of casts. She had a floating right kidney. No evidence of infection was found, and, on making an examination of the upper urinary tract, both kidneys were catheterized. The unique feature of her case was the finding of perfectly normal urine from the left kidney, while albumin and casts were found in the specimen from the right side. The pelvis of the right kidney was distended by an injection of sterile boric acid solution, and an attack of pain was brought on identical in nature and location with the attacks she had suffered. Under observation for several weeks the urine was at times found to be normal. After a severe attack brought on by walking, I again catheterized both kidneys and found the same interesting difference in the two specimens of urine. On examination under anæsthesia, the right kidney is easily carried down over the brim of the pelvis. I propose to fix the kidney and hope to relieve her symptoms, and shall be interested to learn

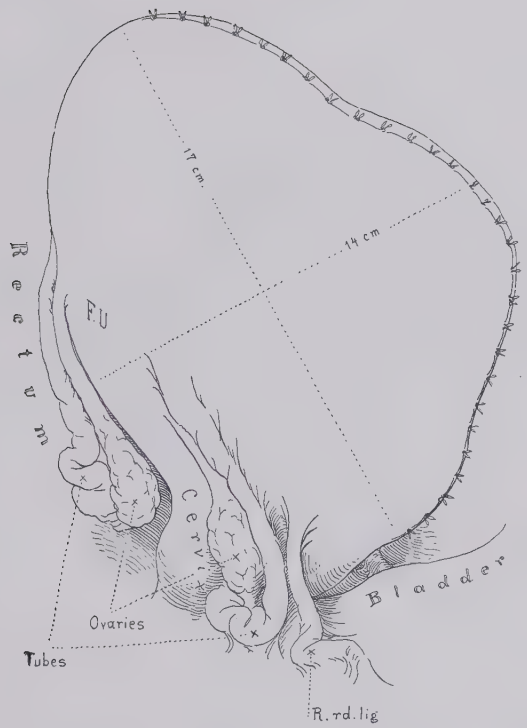

FIG. 6.—Uterus of Miss M. L. after extirpation of the myomatous tumor; showing great muscular hypertrophy, and measuring, when returned to the abdomen, 14 x 17 centimetres. A row of twenty-nine sutures was used in closing the incision in the uterine wall. Operation performed January 9, 1897.

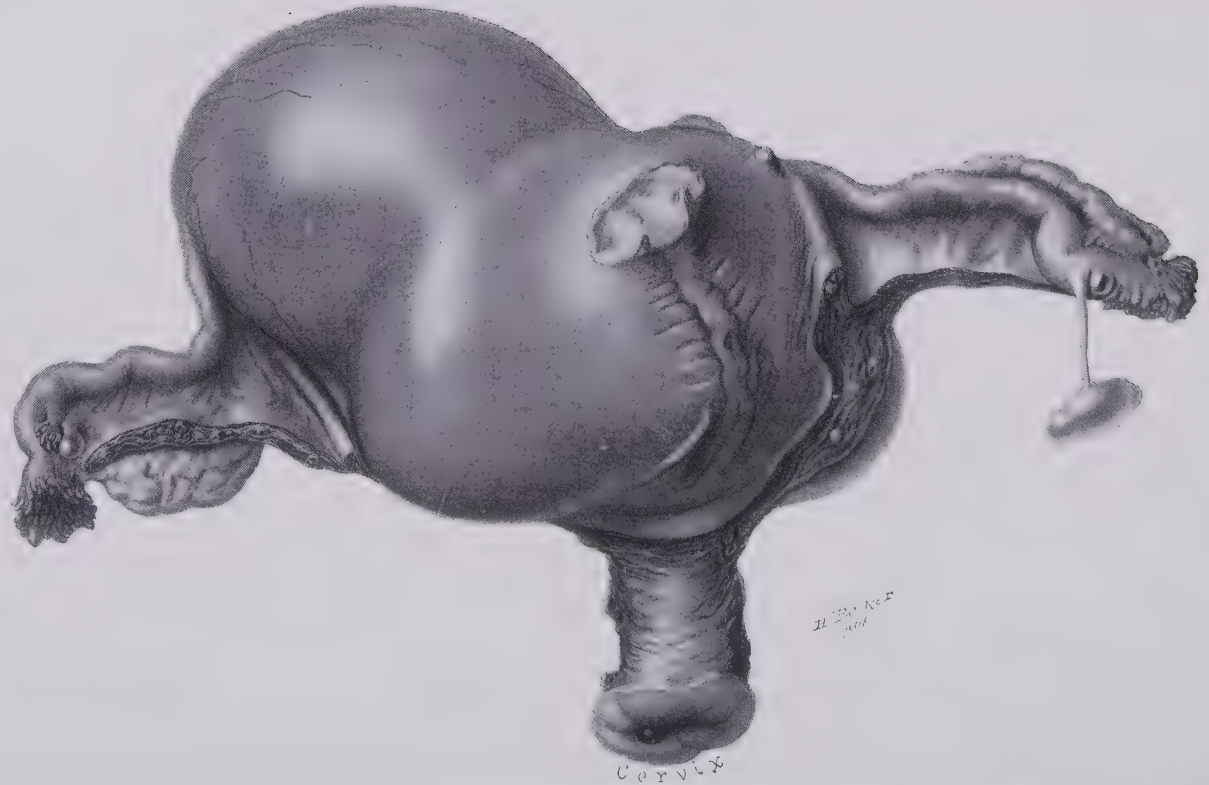

FIG. 7.—Showing the uterus of Miss M. L., with its newly developed myomata, resembling somewhat a bicornute uterus; the cervix with a polyp; an accessory fimbriated opening in the right tube; the left ovary turned up and adherent to the tube. March 5, 1902.

whether the restoration to a normal position will result in a disappearance of the signs of nephritis.

By a gradual process of evolution, I think we have an ideal operation for the fixation of the kidney. I begin in the angle formed by the last rib and the erector spinæ muscle, and make the incision from five to eight centimetres in length downward and forward about parallel with the rib. The latissimus dorsi muscle usually crosses this incision about midway in its course. The edge is grasped by skin retractors and drawn posteriorly, thus exposing the posterior border of the external oblique. This muscle is retracted anteriorly and the border of the internal oblique is exposed, together with the lumbar fascia which gives origin to the transversalis muscle. We have thus exposed the superior lumbar trigonum. An artery-forceps is plunged through this fascia, and on spreading its blades you see the perirenal fat appear through the opening. The lumbar fascia is now cut or torn until its opening is of the desired dimensions. The kidney, enveloped by its fatty capsule and fascia, is now usually seen sliding up and down in this wound. If it is not in sight, the retroperitoneal fat is grasped with artery-forceps and drawn out until the tension is communicated to the fascia renalis, thereby bringing the kidney into the wound. The forceps are left on the perirenal fat and capsule, to act as a weight in temporarily anchoring the kidney in the desired position. After bluntly tearing through the posterior layer of the fascia renalis, the kidney surface is exposed. The organ is permanently fixed by two silk sutures passing through its cortical substance and the edge of the quadratus lumborum muscle. One suture is taken as high as possible and the other near the lower pole. The first lumbar nerve is freed from its sheath on the anterior border of the quadratus muscle and pushed into the depths of the wound to escape being caught in the suture. Each suture passes first through the edge of the muscle and then penetrates the kidney cortex three times, forming a triangle within its substance and two suture bridges on the renal capsule, when it is again carried through the muscle border and there tied. The kidney is now firmly anchored, but to supplement its fixation we make use of the fascia renalis. The excess of fascia and fat which the artery-forceps have drawn out is cut off and the edge of the fascial capsule is caught in the first row of muscle sutures, or the row which brings the

lumbar fascia and internal oblique across the kidney to be attached to the fibres of the quadratus lumborum. The second row of sutures approximates the edges of the external oblique and the latissimus dorsi. As a matter of fact this second row is hardly necessary, for these two muscles resume their natural positions after this gridiron incision. The skin is closed by a continuous subcutaneous suture of No. 2 catgut.

The patient will be kept on her back and right side until she leaves her bed on the sixteenth day. The urine is studied daily until the disappearance of blood-corpuscles and casts. These can be found for several days after this fixation operation. The urine generally becomes normal before the end of a week.

Dr. Guy L. Hunner, the resident gynæcologist, will next operate on a case of suspension of the uterus, and on one in which a salpingo-oophorectomy will probably have to be performed.

SUSPENSION OF UTERUS; RESECTION OF A CORPUS-LUTEUM HÆMATOMA.

This patient entered the hospital two days ago; she is twenty-seven years of age and has a good family and past history. She began menstruating at the age of fourteen and has always been regular, the flow lasting about five days and being accompanied by an aching pain on the first day. She was married four years ago, has one child two and one-half years old, and four months ago had a miscarriage of a two months' fœtus. She dates her present illness from four years ago, when pain began in the back, a leucorrhœal discharge appeared, and she had painful micturition. These symptoms have increased to the present time. On examination for admission to the hospital, I made a diagnosis of retroflexed uterus, probably adherent, with a left pyosalpinx. But on examination under ether I find the uterus in retroflexion and extreme retroposition, easily brought forward. The right adnexia are normal; the left ovary is about twice the normal size, in prolapsus, and presents a smooth, cystic appearance on its median side. This ovary was very sensitive and mistaken for a pus-tube at the first examination.

You will observe that we prepare the field of operation in the operating room rather than in the ward. We believe that the preparation after the patient is under ether can be made more thorough

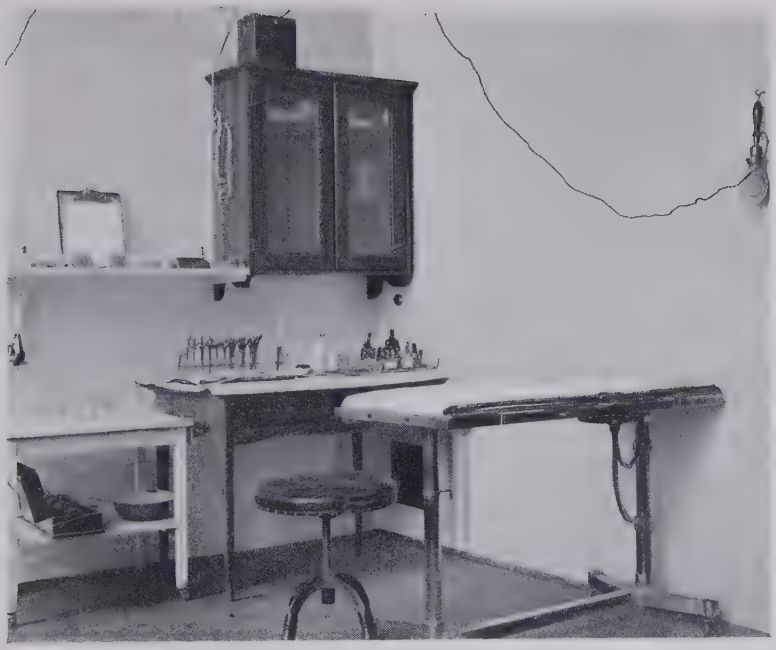

FIG. 8.—Dr. Kelly's cystoscopy room at the Johns Hopkins Hospital.

FIG. 9.—The gynæcological operating-room at the Johns Hopkins Hospital.

than in the ward; the latter occupies at least two hours, and it upsets the mental condition of the patient at a time when she should be worried as little as possible. Our preparation consists of two stages. First, the field of operation is shaved and thoroughly scrubbed with green soap and scrubbing-brush, and then scrubbed with ether and a ball made by tightly wrapping non-absorbent cotton in a double layer of gauze. The second cleaning is done by an assistant with sterile hands or with gloves, and consists of scrubbing with tincture of green soap followed by alcohol, ether, and bichloride, the entire process occupying about ten minutes. Dr. Henry Harris, then a fourth-year student, reported in the *American Journal of Obstetrics,* 1899, an interesting series of bacteriological experiments done in this room. He showed that absolute cleansing of the skin is impossible by our ordinary methods; the first cleaning gets rid of many of the superficial bacteria, and the second is still more effectual, sterile cultures often being taken from the surface of the skin after the patient was prepared in the manner described.

I make a long incision, in order to correct the position of the uterus by the combined method of shortening the uterosacral ligaments and the ventral suspension. With the patient in the high Trendelenburg position the intestines tend to sink out of the pelvis. They are easily held back in the abdominal cavity by small cylindrical bolsters, about ten centimetres long and four or five centimetres in diameter, made of non-absorbent cotton, wrapped tightly and sewed in one thickness of the heavy gauze used in the ordinary roll bandage. They are inserted dry and have great adhesive power for keeping back the slippery intestines; I know of nothing else so effectual for this purpose. The danger of leaving a bolster in the abdominal cavity is prevented by this tape which is sewed to the bolster and clamped at its outer end. After two or three bolsters are inserted and rest on the pelvic brim, the abdominal gauze, wet with salt solution, is so placed as further to protect the abdominal cavity from loss of heat and moisture, and in infectious cases it prevents the entrance of material from the pelvis.

Now that the pelvis is clear, you see the uterus presenting not by its fundus, but by its anterior wall at the uterocervical junction. I reach into Douglas's pouch, and, grasping the fundus, easily

bring it up into position. With the uterus held in the normal anteposition, the round ligaments, which were before stretched, are now sagging between the uterus and the internal ring. No operation yet devised for the correction of a retroposed uterus is ideal, but we still adhere to the ventral suspension because of the excellent results obtained. As I hold this uterus in a slight anteposition, the round ligaments enter the internal rings at a plane that lies posterior to the plane of their attachment in the uterus. Manifestly, any force applied at the internal ring will carry the uterus back until the two planes superimpose. I have frequently demonstrated this at autopsies.

If any round ligament operation is to be done, I prefer that recently described by Professor Clarence Webster in the *Journal of the American Medical Association,* October, 1901. His operation changes the plane of insertion of the round ligaments from the anterior to the posterior wall of the uterus, thus gaining from two to three centimetres in the cephalo-caudal direction. Even with this procedure the round ligaments are exerting their force at a great disadvantage. In doing the ventral suspension, I catch the peritoneum at a point high above the symphysis pubis. I have always feared intestinal obstruction after this operation, and think the danger lessened if the space superior to the bladder is large enough for the bowel to enter and escape freely. Another danger is incarceration during pregnancy. Instead of inserting the first silk suture through the mid-plane of the uterus and the second suture through its posterior wall, I place the first suture in the anterior wall and the second in the mid-plane. This loses somewhat in mechanical advantage, but gives the uterus a better opportunity for rising normally in case of pregnancy. Many of our former cases are now being delivered by the obstetrical department, and we have seen no ill results; but reports occasionally come from other sources to demonstrate that the operation is not devoid of danger from this source. I have omitted the shortening of the uterosacral ligaments in this case because of the rapid pulse, probably associated with a mitral stenosis. We often combine these operations, and find the uterosacral ligament operation, first described by Dr. Kelly in the *American Journal of the Medical Sciences,* 1888, to be an efficient aid in the correction of the malposition.

We usually close the abdomen in layers, using catgut throughout; at first, this running suture of No. 2 gut through the peritoneum, then from two to four interrupted sutures through the muscle bellies, catching up the peritoneum. If the opening incision has exposed only one muscle belly we open the other fascial sheath and expose the muscle. These sutures are of No. 1 catgut and are not intended for present strength; they bring the muscles together for a future strong scar, and at the same time bring up the peritoneum to prevent a possible collection of blood between muscle and peritoneum. For the immediate strength of the wound, we depend upon a row of mattress sutures through the strong fascia, using No. 3 catgut which is hardened and made more durable by soaking for five hours in ten per cent. formalin, then washed under the tap for twelve hours, and then sterilized in cumol. We have experimented with this formalin catgut as a subcutaneous stitch and have found it to remain strong for from fifteen to twenty-five days. The subcutaneous stitch generally used is No. 2 cumol gut; if the patient has a thick subcutaneous fat layer and a tendency to bleed, we first use a few No. 1 interrupted fat sutures. As an abdominal dressing we have used for a number of years the silver leaf; it is the foil used by the dentists, and is sterilized in the autoclave with the other dressings. Each of these books of silver costs about ten cents. Dr. Bolton's bacteriological experiments, made in our laboratory and reported in the *International Medical Magazine,* December, 1894, show the antiseptic qualities of the silver leaf, and it is a pleasure to see our tenth-day dressings of perfectly dry wounds. Before finishing each abdominal section the nurse gives a rectal enema of one litre of normal salt solution; we have found that this lessens the intense postoperative thirst and the patient secretes from six hundred to eight hundred cubic centimetres of urine during the first twenty-four hours after the operation. We believe that this procedure adds wonderfully to the comfort of the patient, and does away with the danger of postoperative suppression of urine.

LEFT SALPINGO-OOPHORECTOMY; RESECTION OF THE SIGMOID FOR CARCINOMA; END-TO-END ANASTOMOSIS; SUPRAPUBIC DRAINAGE.

This patient entered the hospital two days ago, complaining of severe pain in the lower back, particularly on the left side. She

is fifty-two years of age and has always enjoyed good health. She married at the age of twenty, and has had three children and two miscarriages. All of her labors were normal. The menopause occurred eight years ago and she has been healthy since. The present illness began three to four months ago, and two days before admission the pain became so severe that she went to bed. She has had no vaginal discharge and no bleeding. There has been no loss of weight or strength; there has been some tenderness in the lower abdomen on deep pressure. She is usually constipated, but has noticed no unusual bowel disturbance; micturition is normal, and the appetite is very good. When I examined her for admission to the hospital I detected a small, tender mass on the left side, and this, with the few questions I asked, gave me the impression that she might have a beginning carcinoma of the ovary. On examining her in bed in the ward yesterday, I could find nothing abnormal in the pelvis, but was so convinced of my first impression that she was ordered on for ether examination to-day. I am a firm believer in the importance of first impressions gained on seeing a patient. We should always make an outline, be it ever so brief, of the first examination and its results. We are seldom so enthusiastic in later examinations; and, if the first impressions be forgotten, important details may be overlooked. Be equally careful, however, not to allow your first impressions to so prejudice you that future investigations fail to add new light and possibly change your diagnosis completely.

Now under anæsthesia we find a normal uterus very freely movable and normal senile right adnexa. The left lateral organs seem perfectly free near the uterus but towards the pelvic wall they become thickened and more fixed. At about the position where the ovarian vessels cross the pelvic brim is a small body, about the size of an English walnut. It is rather irregular in outline and consistency, but feels in general much like an ovary; it is fixed to the pelvic wall near the brim. If this were a younger woman, in active menstrual life, I would say she has some perioöphoritis. I would attempt to break up the adhesions bimanually and then send her back to the ward for further observation and conservative treatment. But with the existing conditions I cannot be satisfied until the abdomen is opened and we see what is within. If she has a carcinoma of the ovary, I should think, from its adherent

condition, that an operation would do no permanent good; but the conservative procedure in a case of such doubt is to open the abdomen and give immediate relief or make sure that no help can be rendered. Now that the pelvis is clear of intestines, the normal uterus and normal right structures are seen; the left tube is normal for its proximal half, while its distal half is intimately wrapped about the senile ovary and partially covered by a tent of adhesions, formed by the peritoneum of the sigmoid and that of the lateral pelvic wall. And here, just beyond and above the ovary, is the mass we felt and considered to be the ovary. It is in the wall of the sigmoid; it is hard and irregular on palpation, and is undoubtedly a beginning carcinoma of the bowel. There are no enlarged glands in the mesosigmoid; and, if there were, we would not be deterred from operation, for such glands often represent a simple inflammatory hyperplasia. What the significance may be of these adhesions about the outer portion of the bowel, I am not prepared to state, but we hope that the microscope will reveal inflammatory tissue only. Instead of freeing the adhesions between the bowel and the tube and ovary we will resect the tube and ovary from the uterus; and now on cutting the peritoneum of the lateral pelvic wall, the sigmoid with the tube and ovary is easily brought up out of the abdominal cavity. This exposes the upper portion of the ovarian artery which we now tie and cut; it also exposes the ureter, whose thickened peritoneum is intimately adherent to the under side of the mass. By blunt dissection we free the ureter, and I resect a small portion of its thickened peritoneum for microscopical examination, for upon this will depend the prognosis. We now begin the resection of the diseased portion of the bowel. Holding the mesocolon towards the light I can easily determine its circulation; and, tying these large mesenteric vessels at a safe distance beyond the growth, with large artery-forceps we clamp off the portion to be resected. With the knife I make a clean cut outside the clamps, placing small mouse-tooth forceps on the four cardinal points of the bowel as these are exposed by the resection. We place iodoform gauze in each lumen to keep our field of operation clean.

Bringing the mesenteric borders together, I begin the anastomosis by using the square stitch knotted within, so well described by Dr. F. Gregory Connell in the *Journal of the American Medical Association,* October 12, 1901. Before closing this last half-centi-

metre of the anastomosis I withdraw the gauze from the lumen, and carefully wipe the field with wet gauze. This remaining opening is closed by two mattress sutures, tied outside, according to the Halsted circular-suture method. It saves time on the last stitch, and is much simpler than attempting to tie inside, as recommended by Connell. When the square stitch is carefully set and tied within it is almost impossible to expose any portion of the sutures from without, and the union is so accurate and firm that I do not think of running a second layer around the outside. R. de Bovis has recently reviewed four hundred and twenty-six cases of cancer of the large intestine from the anatomical, clinical, and therapeutic features.[1] Because of this large area on the pelvic floor, denuded of its peritoneum, I now make a wick of gauze rolled with rubber protective, which is carried through the lower end of the incision to the pelvic floor, beside the site of anastomosis. This wick will be withdrawn about the fourth day and the wound will be dressed with dry iodoform gauze until healed. Because of the drainage we close this wound with interrupted silkworm-gut sutures, passing through the entire abdominal wall. Intestinal cases do not get the saline enema, and we might have been infusing the patient during the operation. The operation has lasted one hour and twenty-five minutes, and the patient's pulse has ranged from 70 to 76 beats per minute. But in spite of this good condition, we will guard against some of the future discomforts by giving a subcutaneous infusion of five hundred to one thousand cubic centimetres of normal salt solution as soon as the patient reaches the ward. She will have albumen water after twelve hours, and until the bowels move, and then for ten days she may have any liquid nourishment except milk. We aim to have the bowels move early. Calomel in one-eighth-grain doses will be begun in twenty-four hours and given every half-hour until she has a grain. Four hours later, Epsom salts in drachm doses will be given every half hour until the bowels move.

Such a case demonstrates the necessity, on the part of one who wishes to do abdominal work, of being prepared to do any operation that may arise. I expected to do a simple oophorectomy, and must attack a much more formidable problem. Of six bowel resections that I have performed in the past ten months, only one has been undertaken with that object definitely outlined.

[1] Revue de chirurgie, vol. xxiii. p. 822.

Fig. 1.—Dr. John B. Murphy.

Biographical Sketches

OF

EMINENT LIVING PHYSICIANS.

BY GUY HINSDALE, A.M., M.D.

JOHN B. MURPHY, M.D.

THE details of the professional work of Dr. Murphy (Fig. 1) are somewhat as follows:

The forenoons from eight o'clock of every day except Tuesday and Sunday are devoted to examining and operating at the hospitals. Four of these days are at Mercy Hospital. On Monday and Thursday from eight to ten o'clock he makes examinations of patients, and from ten to one he gives clinics to medical students and physicians in which both private and charity patients are operated upon. Wednesday and Saturday from eight to one are occupied with private operations at the same hospital, to which only physicians are invited. Friday morning from ten to one is occupied by his public clinic at the Cook County Hospital (Fig. 2), which is attended by students from all the medical colleges. No patients except charity cases are admitted into Cook County Hospital. In his public clinics the first hour and a half are spent in the examination of patients, the demonstration of specimens from previous operations, the consideration of the progress of cases since operation, and in instructing and quizzing students on the cases. The last hour and a half of his clinic are devoted to operating and the description of the operation and the pathological conditions found as it progresses.

Tuesday forenoon is reserved for operations outside the city or for original experimental work. Dr. Murphy never operates in private houses in Chicago where the physical condition of the patient permits removal to a hospital. This very much concentrates his work, as he has no visits to make except those in consultation.

The time from twelve to one is devoted to luncheon and from two to six-thirty to office work. This office work consists of personal attention to patients where the histories, examinations, and clinical analyses have all been previously made by two office associates. All cases referred by physicians pass through the same course before admission into his private office.

The financial management of his office is unique in that all patients are required to pay the fee to the office attendant in the waiting-room before they are admitted to the doctor's private office, the amount depending upon the kind of examination. He receives no money in the office, himself. This saves very much time and some embarrassment, as the patients all know before they are admitted what the examination will cost them, unless it requires some special examination, as cystoscopy, proctoscopy, ureteral catheterization, urinary segregation, radiography, or examinations of that class. The prices for examinations range from ten to twenty-five dollars. While at first the payment of fees to the office attendant seemed a little difficult for the people to understand, he is convinced after three years' experience with the system that patients prefer it to the old method. Occasionally a hypercritical individual objects, when the attendant very politely excuses him from the office and his number is given to the next. This practically does away with book-keeping and economizes money and time, to say nothing of its salutary effects upon a medical man's temperament.

The interval from six-thirty to eight is devoted to dinner, and that from eight to eleven to correspondence, reading, and writing.

FIG. 2.—Dr. John B. Murphy's clinic at Cook County Hospital, Chicago, Ill.

Special Articles

AN OUTLINE OF THE ORGANIZATION AND WORK OF THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY.

BY E. L. MUNSON, A.M., M.D.,

Captain, Assistant Surgeon, United States Army, Surgeon-General's Office, War Department, Washington, D. C.

The Medical Department of the Army, as increased from a total of one hundred and ninety-two to three hundred and twenty-one medical officers by recent congressional action, consists of a surgeon-general with the rank of brigadier-general, eight assistant surgeons-general with the rank of colonel, twelve deputy surgeons-general with the rank of lieutenant-colonel, sixty surgeons with the rank of major, and two hundred and forty assistant surgeons with the rank of first lieutenant, mounted, for the first five years, and the rank of captain, mounted, thereafter, until promoted to major. At the present writing there are about sixty-five vacancies resulting from the recent increase.

Each vacancy in the department is filled by appointment as assistant surgeon, with the rank of first lieutenant. Appointments are made by the President after the applicant has passed a successful examination before an army medical examining board and has been recommended by the surgeon-general. Due notice of the meetings of the several boards is published in the medical journals. Permission to appear before the board is obtained by letter to the Secretary of War, which must be in the handwriting of the applicant, giving the date and place of his birth and the place and State of which he is a permanent resident, and inclosing certificates, based on personal acquaintance, from at least two reputable persons as to his citizenship, character, and habits. No political in-

fluence in securing this permission is necessary or desired, and appointments are based purely upon merit. The candidate must be a citizen of the United States, between twenty-two and twenty-nine years of age in the case of a candidate applying for appointment from civil life, and between twenty-two and thirty-four years of age in the case of a candidate who has served honorably in the army of the United States, either as a commissioned medical officer of volunteers or as an acting assistant surgeon during the war with Spain or since. He must be of sound health and good character, and a graduate of some regular medical college, in evidence of which his diploma will be submitted to the board. The scope of the examination includes the morals, habits, physical and mental qualifications of a candidate, and his general aptitude for service; and the board reports unfavorably should it have a reasonable doubt of his efficiency in any of these particulars.

The physical examination comes first in order, and is thorough. This careful physical examination is necessary in order to insure that the candidate is fully qualified to undergo the fatigue and hardships which are incident to field service and to which the medical officer is exposed, as he must accompany combatant troops engaged in action and then begin the performance of his special professional duties at a time when all others have sought well-earned and much-needed rest. This examination is also necessary to protect the retired list from being overburdened by those having physical defects, which would render them liable to early breakdown and to become a charge upon the government. That a candidate should possess a well-developed physique, a dignified carriage and presence, and be of good stature is, of course, desirable. Those who fall below sixty-four inches in height are not accepted. Each candidate is required to certify that he labors under no mental or physical infirmity or disability which can interfere with the efficient discharge of any duty which may be required. Errors of refraction, when not excessive and not accompanied by ocular disease, and when correctable by appropriate glasses, are not causes for rejection.

The moral fitness of a candidate, as evidenced by his antecedents and standing in the community of which he is a resident, is ascertained, as far as possible, by special investigations conducted by army medical officers stationed in the vicinity, recruiting officers,

letters addressed to the medical college from which the candidate graduated, the authorities of the hospitals in which he may have served as intern, and the secretaries of the medical societies in the localities in which he may be resident; also by letters addressed to reputable members of the profession known to the officials of the surgeon-general's office. An estimate of a candidate's aptitude for the service is also made by the board, as far as possible, during the week in which he is in attendance on the examinations.

The professional examinations are conducted by both written and oral questions, upon anatomy, physiology, chemistry, hygiene, pathology and bacteriology, therapeutics and materia medica, surgery, practice of medicine, obstetrics, and the diseases of women and children. These examinations, while very searching, are intended to be thoroughly fair and free from "catch questions;" the purpose, of course, being to determine whether or not the candidate is well educated in the branches of a general medical education and is competent to enter upon the many-sided functions of the army medical officer. Examinations are also conducted at the bedside in clinical medicine and surgery, and operations and demonstrations are required to be made by the candidate upon the cadaver.

This thorough professional examination lies at the foundation of the efficiency of the Army Medical Department, and has existed since the creation of an army by the first levy of troops raised by the second provincial congress of Massachusetts Bay, in an act dated May 8, 1775, whereby medical officers of regiments could be appointed only "*Provided* they appear to be duly qualified on examination." That the examination thus required was not of a perfunctory nature may be gathered from the following extract from a military journal of the time. "On the day appointed, the medical candidates, sixteen in number, were summoned before the board for examination. This business occupied about four hours; the subjects were anatomy, physiology, surgery, and medicine. It was not long after that I was happily relieved from suspense, by receiving the sanction and acceptance of the board, with some acceptable instructions relative to the faithful discharge of duty and the humane treatment of those soldiers who may have the misfortune to require my assistance. Six of our number were privately rejected as found disqualified. The examination was

in a considerable degree close and severe, which occasioned not a little agitation in our ranks." The scope of the examination was subsequently amplified in the Army Regulations of 1825, and from 1832 to 1893 an army examining board convened regularly in New York for the examination of candidates. Since 1893 these examinations have been held in Washington, and recently also in San Francisco, Cuba, and Manila. Eleven hundred and eighteen young physicians have been ordered up for examination by the various army boards for the period 1889 to 1901, inclusive, of which number one hundred and eighty-seven have been approved. This proportion of successful candidates was rendered unusually high because of the examination of a large number of young surgeons serving under temporary contract, who had already undergone a preliminary physical and professional examination and thus represented the better element of the original body of candidates.

Hospital training and practical experience in the practice of medicine, surgery, and obstetrics are essential to candidates, who are expected to present evidence that they have had at least one year's hospital experience, or the equivalent of this in practice.

Candidates presenting a degree in arts, sciences (other than medicine), or literature, and those who hold first-class teachers' certificates or who submit evidence of graduation from a reputable high school or similar institution (approved by the board) are not now ordinarily examined in other than the professional subjects enumerated above. If, however, a candidate during his professional examination by the board present evidence of a deficiency in his general education in elementary subjects, he is required to undergo an oral examination in arithmetic, history, geography, literature, and physics, and such examination, if unsatisfactory, is cause for rejection. Approved candidates claiming especial knowledge of the higher mathematics, ancient or modern languages, drawing, analytical chemistry, or branches of natural science are examined in those subjects as accomplishments and receive due credit and a rating in their classes therefor according to their proficiency.

To save unnecessary expense to a candidate desiring a preliminary physical examination, written authority is usually given by the surgeon-general for the applicant to present himself at the nearest military post, garrison, or recruiting station for examination by the surgeon. Any opinion given as to the result of such preliminary

examination is, however, considered as purely advisory and not as determining the subsequent action of an army medical board in the case.

The merits of the candidates in each of the several branches, and also their relative merit as evinced by the results obtained from the entire examination, are reported by the board, and in accordance with this report approved candidates are appointed to existing vacancies or to such as may occur within two years thereafter. An applicant failing in one examination may be allowed a second after one year, but not a third. No concession is made for the expenses of persons undergoing examination, but those who receive appointments are entitled to travel allowances in obeying the first order assigning them to duty.

Section 1172, Revised Statutes of the United States, provides that " No person shall receive the appointment of assistant surgeon unless he shall have been examined and approved by an army medical board, consisting of three surgeons or assistant surgeons designated by the Secretary of War; and no person shall receive the appointment of surgeon unless he shall have served at least five years as an assistant surgeon in the regular army, and shall have been examined and approved by an army medical board, consisting of not less than three surgeons designated as aforesaid." The act to increase the efficiency of the military establishment of the United States, recently approved, further provides " That the period during which any assistant surgeon shall have served as a surgeon or assistant surgeon in the volunteer army during the war with Spain or since shall be counted as a portion of the five years' service required to entitle him to the rank of captain."

Promotion of the newly appointed assistant surgeon to the grade of captain is contingent upon a satisfactory examination not only in the main subjects of a medical education, but also in many which relate more particularly to his functions as an officer of the military service. A similar examination must be passed for promotion to the grade of major. These examinations serve as a stimulus to professional advancement, taking the place in this respect of the active competition which exists in civil practice. That these examinations are severe and not of a perfunctory nature is shown by the fact that a certain proportion of medical officers are turned back from time to time, with resulting loss in pay and

promotion. Advancement to the grade of lieutenant-colonel and colonel takes place without further examination. The surgeon-general is selected by the President from among the members of the department, usually those of higher rank and greater experience.

To each rank is attached a fixed annual salary, which is received in monthly payments, and this is increased by ten per cent. for each period of five years' service until a maximum of forty per cent. is reached. An assistant surgeon with the rank of first lieutenant, mounted, receives $1600 per annum, or $133.33 monthly. At the end of five years he is promoted to captain and receives $2000 a year, which, with the increase of ten per cent. for five years' service, is $2200, or $183.33 per month. After ten years' service as captain the pay would be $2400 annually, or $200 per month. The pay attached to the rank of major is $2500 a year, which, with ten per cent. added for each five years' service, becomes $3000 after ten years' service, $3250 after fifteen years, and $3500 after twenty years. The monthly pay of lieutenant-colonel, colonel, and brigadier-general is $333.33, $375, and $458.33, respectively. In addition to the above amounts, medical officers on duty in the Philippine Islands receive a further increase of ten per cent. on their pay while so serving.

Medical officers are entitled to the privilege of retirement at any time for disability incurred in the line of duty or after forty years' service. On attaining the age of sixty-four they are placed upon the retired list by virtue of law. Retired officers receive three-fourths the amount of their pay proper at the time of retirement. This privilege of retirement thus provides a sufficient income for support in case of disability contracted in the service and for old age. In the case of an officer retired as colonel at the age of sixty-four years, his retired pay would amount to $3375 annually, which would be a fair interest on $75,000, or a greater sum than the average physician could hope to save in a long life of professional activity. In the case of death due to causes incident to the service, a pension is granted by the government to the dependent members of the deceased officer's family. This pension in the case of an officer of the grade of lieutenant-colonel or colonel amounts to $30 per month, with a small allowance for each minor child.

Leave of absence on full pay is allowed at the rate of one month per year, and this when not taken may accumulate to a maximum of four months, which at the end of four years is then available as one continuous leave. Beyond this an officer may still be absent with permission on half pay. Absence from duty on account of sickness involves no loss of pay.

While he will never become rich, financial matters need not be a cause for anxiety to the army medical officer. The amount of pay depends largely upon the grade held, and this in turn is largely dependent upon length of service. Until recently the grade of major was attained in about eighteen years. Recent legislation has increased the length of this period, but it is confidently anticipated that this mistake will soon be rectified by congressional action.

In addition to their pay proper, officers are furnished with a liberal allowance for quarters according to rank, either in kind or, where no suitable government building is available, by cash commutation. No house-rent has therefore to be paid by the medical officer. When travelling on duty, an officer receives mileage for the distance travelled; the amount allowed, seven cents per mile, is sufficient to cover all expenses of journey. On change of station he is entitled to transportation for professional books and papers and a reasonable amount of baggage at government expense. Mounted officers, including all officers of the Medical Department, are provided with forage, stabling, and transportation for horses owned and actually kept by them, not exceeding two for all ranks below a brigadier. Groceries and other articles may be purchased from the commissary and fuel from the quartermaster's department at about wholesale cost price, and less the usual retail dealers' profits. Instruments and appliances are supplied in abundance for the use of medical officers in the performance of their duties.

Well-selected professional libraries are supplied to each hospital, averaging from one hundred and fifty to two hundred volumes each. In character, these libraries are kept fully abreast of professional advancement. The obsolete books are constantly being called in and sold and new books issued in their place. In the year 1900 thirty-five volumes, of current publication, were thus issued to all permanent hospital libraries. In addition, the surgeon-

general's office subscribes to a number of representative medical journals published in the United States and abroad, twenty-two in number, which are circulated among all permanent military posts for perusal by medical officers. Any special works desired by medical officers can be obtained on request from the library of the surgeon-general's office in Washington. Every facility is thus afforded army medical officers to keep fully informed as to current medical progress.

When medical officers with the rank of captain approach the period of their examination for promotion to a majority, they are usually assigned to duty as attending surgeons in the principal medical centres of the United States, to enable them to become familiar with the practice of the leading physicians and surgeons in this country, and to attend medical lectures, meetings of medical societies, etc. These assignments are made for one year only, in order that as many medical officers as possible may be enabled to avail themselves of the advantages thereby afforded. At the end of this tour of duty they are required to make a detailed report to the surgeon-general, showing how much of their time has been occupied by their official duties and to what extent they have availed themselves of the advantages offered for professional advancement. With the concentration of troops at posts near large cities in the United States, medical officers have an excellent opportunity to keep fully in touch with the professional progress of civilian physicians and surgeons.

In 1893 the Secretary of War authorized the establishment of an Army Medical School in the city of Washington for the purpose of instructing medical officers who have been appointed since the last preceding term of the school, and such others as may be authorized to attend. The course of instruction is for five months, and is given annually, when practicable, at the Army Medical Museum, in Washington City, commencing in November. Five professors are selected from among the senior medical officers of the army, stationed in or near the city of Washington, and there is also provided an instructor in first aid and ambulance drill.

The faculty of the Army Medical School consists of: (1) A president of the faculty, who is responsible for the discipline of the school, and who delivers a course of lectures upon the duties of medical officers in war and peace (including property responsi-

bility, examination of recruits, certificates of disability, reports, rights and privileges, customs of service, etc.). (2) A professor of military surgery (including the care and transportation of wounded and operative surgery). (3) A professor of military hygiene (including practical instruction in the examination of air, water, food, and clothing from a sanitary point of view). (4) A professor of military medicine. (5) A professor of clinical and sanitary microscopy (including bacteriology and urinology). The course of the Army Medical School is so arranged as to cover subjects which are of the greatest importance to the army medical officer, yet which are not taught in the medical schools of the country. At the recent graduation exercises of this school twenty-three graduates received diplomas from the Secretary of War.

The medical work of the army is at present being performed by a total of seven hundred and thirty-six physicians, of whom two hundred and sixty belong to the regular Medical Department, two hundred are commissioned officers of volunteers, serving under temporary appointment, and two hundred and seventy-six are civilian physicians serving temporary appointment under contract. They are assisted by the enlisted men of the Hospital Corps, numbering about four thousand. Special nursing in some of the larger hospitals is done by the army nurse corps of female nurses, of whom one hundred and twenty-five are now in service. This vast medical force is scattered at more than four hundred military hospitals, varying in size from six to one thousand beds, at army posts all over the United States, above the Arctic Circle in Alaska, below the tropics in the West Indies and Philippine Islands and with the legation guard in China. In 1901 it had the care of a total of two hundred thirty-two thousand and eighty admissions to sick report, of which nineteen thousand seven hundred and three were for injuries. It also performed a large number of surgical operations; as one item in this respect it may be mentioned that there were three hundred and thirty-six operations for the radical cure of hernia in the above year.

The work of direction, supply, and disbursement, as far as the Medical Department is concerned, is carried out from the office of the surgeon-general, which is divided for this purpose into several departments, with medical officers in charge to control the routine work and take as much minor responsibility as possible from the

shoulders of the surgeon-general. All orders affecting medical officers emanate from the surgeon-general himself. Upon him also devolve vast financial obligations. Thus, for the year 1901, the amount of funds disbursed for medical supplies, medical attendance, pay of civilian employés, and washing of hospital linen amounted to nearly two million dollars.

The control of the hospital corps is largely left to the medical officer detailed in special charge. The officer in charge of medical supplies is assisted in his work by medical purveyors stationed in the cities of New York, St. Louis, and San Francisco. The sanitary and disbursing division is practically in charge of the statistical work and medical records, and also has charge of the disbursement of funds for artificial limbs to crippled soldiers. The expenditure under the latter appropriation alone amounts to about six hundred thousand dollars a year, all claims for which have to be acted upon separately and with much care to prevent injustice to the pensioner and the government. The force required in the surgeon-general's office to carry on its routine business numbers one hundred and twenty-six clerks and eight officers.

Under the supervision of the surgeon-general is also the working of the library of the surgeon-general's office (Fig. 1), the largest medical library in the world, which on June 30, 1901, contained two hundred and thirty-six thousand seven hundred and twenty-eight books, journals, theses, and pamphlets, of which one hundred and forty thousand five hundred and thirty-nine were bound volumes. Under his charge also is the Army Medical Museum (Fig. 2), in the same building as the library, and containing a large and constantly increasing collection of specimens relating to the various phases of medical science. Thus, on June 30, 1901, the museum contained no less than thirty-four thousand nine hundred and eighty-eight specimens of all kinds, of which twelve thousand one hundred and fifty-three represented pathological conditions. Like the library, the museum is much hampered by lack of space and by insufficient funds, and it is hoped that its pressing needs in these respects will be remedied by congressional action in the not distant future. The library and museum have proved of much value to the medical profession of the country, and are constantly furnishing information, data, and books of reference to physicians all over the United States. Medical men interested in investigations along special lines

FIG. 1.—Surgeon-General's Library at Washington.

FIG. 2.—Army Medical Museum at Washington.

of work find in the library an almost inexhaustible fund of information on these special subjects. Of the unequalled opportunity thus afforded for literary research, a considerable number of medical men throughout the country constantly avail themselves.

A portion of the library and museum building is devoted to laboratory work under skilled chemists and microscopists, where a vast amount of routine sanitary work is done. In addition, much original investigation is also carried on, and it was here that a large part of the work in connection with the recent brilliant discovery of Major Reed touching upon the transmission of yellow fever by the mosquito was carried out. Similarly equipped laboratories are also maintained in Manila and Havana for bacteriological and other special investigations into the causation of disease, and from these laboratories much valuable medical information has come as a result of the work of army medical officers. Thus, in passing, it may be mentioned that since the end of the war with Spain medical officers have discovered the means of transmission of yellow fever and the measures necessary to remove it from an infected locality; have found the cause of the fatal anæmia of Porto Rico, which carried off many thousands of lives until it was shown to be chiefly due to ankylostomiasis, and as such curable by the use of thymol and a cathartic; have established the fact that Malta fever existed in the West Indies and the Philippines; have identified surra as the fatal disease destroying animals in the Philippines and discovered that it was propagated by a biting fly; have investigated the animal parasites common to the Philippine Islands; have studied tropical dysentery and found it to be largely due to a specific bacillus; and by their investigations have contributed largely to our knowledge of plague. As instances of what it has done in a sanitary way, it may be mentioned that the Army Medical Department in three months vaccinated the entire population of Porto Rico, numbering some nine hundred thousand souls, absolutely eradicating smallpox where it had previously been epidemic; while in Havana, under the health officer detailed from the Army Medical Department, the death-rate fell from 91.03 in 1898, the last year of Spanish occupation, to 22.11 for 1901, and a rate for the first three months of the year 1902, up to the present time, equivalent to 17.06, or less than that of many of the larger cities in the healthful portions of the temperate zone. The yellow

fever which had been endemic for nearly a century and a quarter, destroying an average of four hundred lives annually, was absolutely eradicated from Havana.

The above excellent results are largely due to the far-seeing scientific policy of Surgeon-General Sternberg (Fig. 3), by which men possessing an aptitude along certain lines of work were given facilities to perfect themselves in these respects and then afforded an opportunity to make practical use of the talent so acquired. It has been his apparent aim to select for the performance of a certain work, as far as possible, the men best qualified for this purpose, irrespective of other considerations. The result of this policy can be seen in the magnificent record made by the department in the last few years, only a few of the more prominent features of which have been touched upon above. To the ambitious medical officer every opportunity has been afforded, and every incentive offered, to reflect credit upon himself and his department through his own professional advancement. This liberal policy has not always obtained in the past in the government medical service, and the attitude assumed by Surgeon-General Sternberg in this respect cannot be too highly commended. His retirement on June 8 of this year, after forty-one years of most varied service as a practising surgeon, sanitarian, and executive, marked the close of a period of medical progress unequalled in the history of the Army Medical Department. Three times brevetted for gallantry in action, a recognized authority the world over on sanitary matters, a wise and able head of his department through the wars with Spain and in the Philippines and in China, his retirement for age is a distinct injury to his corps and his country. The value of his services to the army, to the country, and to humanity will be long remembered.

FIG. 3.—Surgeon-General George M. Sternberg seated in his private office at Washington. (Photograph taken especially for the INTERNATIONAL CLINICS shortly before his retirement.)

SOME NOTES UPON THE MANAGEMENT OF A MODERN PRIVATE HOSPITAL.

BY H. A. KELLY, M.D.

The establishment of private hospitals is becoming increasingly frequent, and the necessity for them has been abundantly demonstrated. It would seem, therefore, that a brief account of the management of such an institution in detail is just now appropriate, not only because it may afford some suggestions of practical utility, but also because it will at some future day furnish information as to methods now in use which will then be in no other way accessible. The private hospital about to be described I established in Baltimore ten years ago. It then consisted of one four-story building capable of accommodating ten patients. In 1893 a second building was added with additional rooms for patients, and in 1900 an annex was built, making the present capacity about thirty patients. The growth of the work was in this way a natural one, accommodations being supplied to meet the constant demand for more room. It is my earnest belief that this is the only way to develop a private institution. I have frequently seen men invest all their savings in a private hospital under the vague impression that having a hospital would of itself bring work, while just the contrary is true, the work must always force the surgeon to provide the hospital. If the natural order is reversed the outcome is sure to be a grievous disappointment.

The following table shows the number of cases treated annually and gives some idea of the extent and growth of the work.

Year.	Number of Patients.	Year.	Number of Patients.
1892	69	1897	138
1893	62	1898	170
1894	95	1899	187
1895	134	1900	177
1896	144	1901	239

The patients entering the private hospital have come from every part of the Union, from Canada, Cuba, South America,

Hawaii, and from China; I cite this fact as further illustrating the necessity of a large *clientèle* from which to draw before establishing an elaborate private hospital.

Connected with the hospital are three associate physicians, graduates of the Johns Hopkins Medical School and formerly house officers of the Johns Hopkins Hospital. The associates are chosen for their especial fitness in the field of work they are expected to cultivate. I feel strongly that in choosing his aids the surgeon ought to seek to draw to his side men whom he looks upon as his equals and in many ways his superiors. The anæsthetist is a permanent appointment filled by one man who is a master of this art. The operating-room assistants are ex-hospital residents fully trained in surgical technics, while the visiting medical house officer and consultant is a medical man who is as much a specialist as is the surgeon in his own line. The number of nurses, maids, domestics, orderlies, and workmen permanently employed averages over fifty people, and at a busy season the number is considerably increased.

The hospital opens during the first week in October and closes during the latter part of July. While many of the patients are women suffering from pelvic diseases requiring operative treatment, other cases of surgical abdominal affections, in men as well as women, are also received and treated. The list of affections thus treated in the course of a year includes gall-bladder surgery, gastro-enterostomy, intestinal surgery of other kinds, renal operations of all kinds, ureteral operations, operations upon the appendix vermiformis, and pelvic surgery of all kinds in women, as well as rectal surgery,—covering, in short, the entire domain of the abdomen with the exception of diseases of the lower genito-urinary tract in men.

The case of each patient is carefully investigated on entrance, both medically and surgically, and by physician and surgeon independently of one another. The thoracic, abdominal, and pelvic organs are examined, and chemical, microscopical, and bacteriological studies are made of all excretions and secretions which may throw additional light upon the case. In cases of suspected renal or ureteral disease constant use is made of the X-ray machine, and where infection of the bladder or kidney exists it is always treated in accordance with the cultural findings brought out by a bacteriological examination.

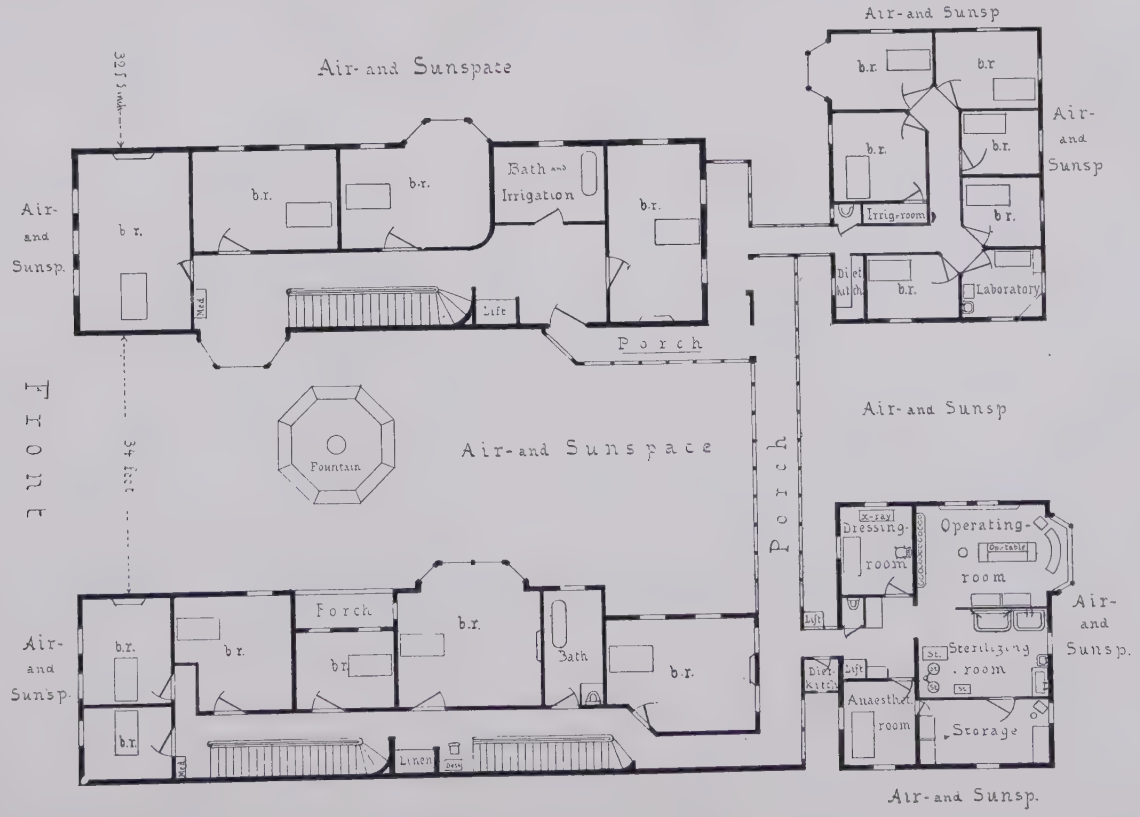

FIG. 1.—Diagram of Dr. Kelly's sanatorium.

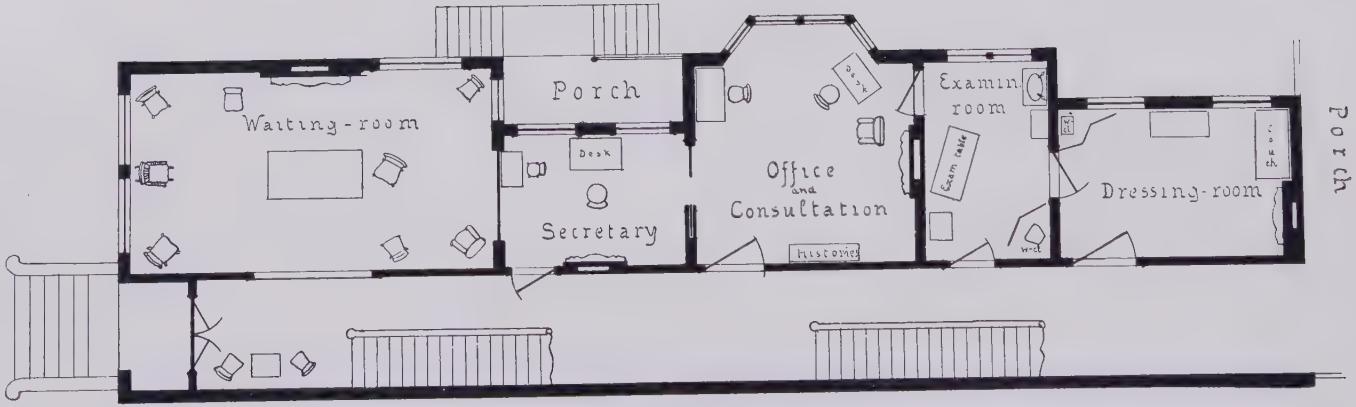

FIG. 2.—Office floor of main building.

One class of cases which requires unusual attention is that of nervous women who have been reduced to chronic invalidism through the existence of some real or imaginary pelvic trouble. Such patients are frequently supposed to need operative treatment, when upon examination no disease is found, and they are restored to health by rest and palliative treatment. On the other hand, it is not uncommon to find definite disease in patients who have been pronounced hysterical or neurasthenic, when it is possible to afford complete relief by surgical aid. There are no cases in which I take greater pride and pleasure than just these poor nervous wrecks in whom an old chronic abdominal affection has been persistently overlooked. I made so many mistakes in my earlier experience and through making hasty diagnoses that I invariably insist on confirmed nervous patients placing themselves under my care for a few days or a week or more, that I may be able to make a minute analysis as well as to review the case several times and get a definite impression of the individual peculiarities, in addition to securing the valuable judgment of others who are likewise watching the patient. Then if one adds to this in many cases an examination under gas or chloroform a mistake is rarely made in the diagnosis.

The hospital buildings consist of two three-story brick dwelling-houses, separated on the contiguous sides by a large open air space and connected in the rear by a large bridge. The first floor of the main building contains reception-rooms, together with private offices. The lower floor of the second building is occupied by a private parlor and the nurses' dining-room (Figs. 1 and 2). The second and third floors of both buildings consist entirely of bedrooms of various sizes (see diagram). In the rear of the two main buildings is a large annex containing six additional bedrooms, the nurses' home, the clinical laboratory, and the operating-room. The basement is occupied by kitchens and laundries.

The operating-room (Fig. 3) is in the annex. It is lighted by a skylight and by windows facing south and west. The operating section is divided off from the sterilizing section by a large marble screen or partition, which makes a convenient division without actually separating the rooms. The walls are coated with waterproof paint and panelled to a height of five feet with slabs of African marble. The flooring is of small square encaustic tiles closely laid. The room is well furnished with electric lights as well as gas-

fixtures; a portable electric light with reflector is attached at a point near the table, in order to afford a stronger illumination when needed. The operating-room is thus detached from the hospital proper, and the *morale* of the patients convalescent and waiting is not disturbed every operating-day by the consciousness of serious surgical work being done in their midst.

The equipment and all the appointments of the operating-room are fully equal to the best general hospitals in the country. A few words as to the furnishings may not be amiss.

The operating-table used is the Boldt; the other furnishings of the operating-room are the hand-made metal instrument-case, close to the operator, as well as the necessary tables with glass tops for instrument-dishes, sponge-basins, and ligature-trays.

A smaller adjacent room contains the water-boilers for sterilizing water, the steam sterilizer for dressings, the vessel for boiling the instruments, and the basins for washing and disinfecting the hands of operator and assistants. The steam sterilizer is one of the larger patterns made by the Kny-Scheerer Company (Fig. 4).

Ligatures.—The ligatures and suture materials are of silk, silkworm-gut, catgut, and silver. Silk is sterilized by Halsted's method. All the catgut used is prepared by the head nurse, following Kroenig's method modified by Dr. G. Brown Miller, formerly chief of the gynæcological staff of the Johns Hopkins Hospital.

Dressings.—The gauze dressings, cotton dressings, and bandages are all made up by the nurses, wrapped in linen covers, and sterilized for three successive days in the large steam sterilizer.

Sponges.—Sea sponges are used extensively and are prepared by the operating-room nurse.

Preparation of Operator and Assistants.—Before entering the operating-room, sterilized linen suits, caps, and shoes are put on by the operator, his assistants, and the nurses, and before each operation extra-sterilized aprons are put over that part of the suit in close apposition to the patient or operating-table.

Preparation of Patient.—Before being brought into the operating-room the patients are fully anæsthetized in an adjoining apartment fitted up like an ordinary sleeping-room. The dress for operation consists of an undervest of flannel, a night-gown open up the back, and a pair of long woollen stockings; the hair may

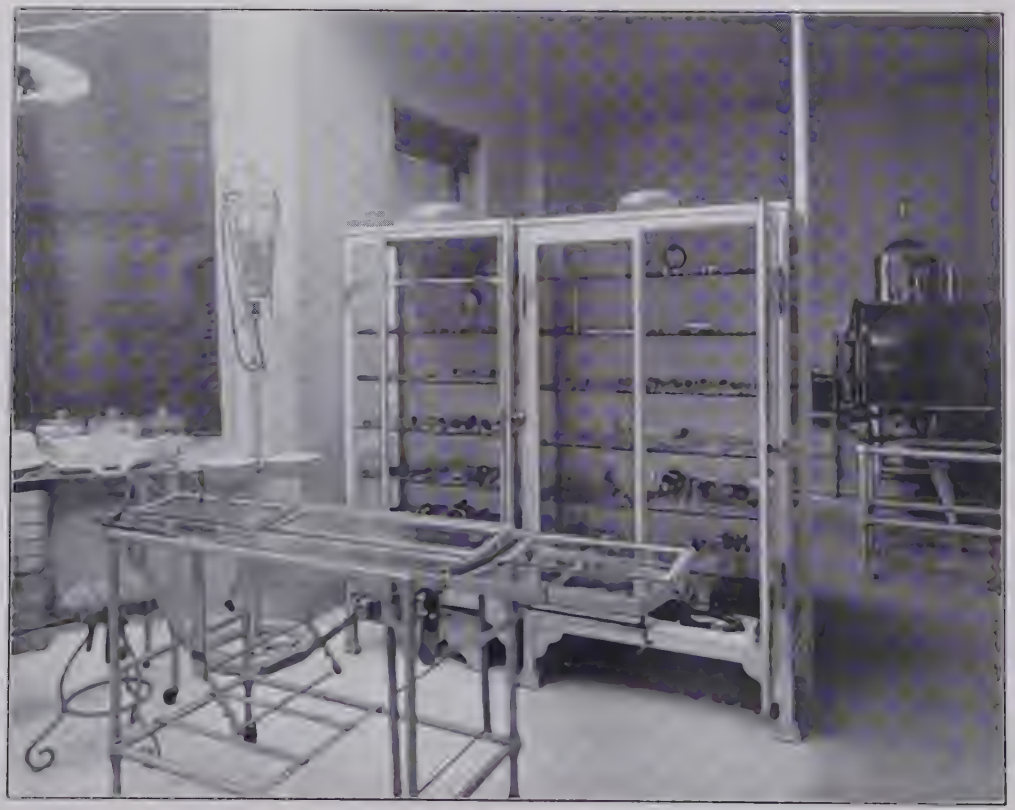

FIG. 3.—Operating-room.

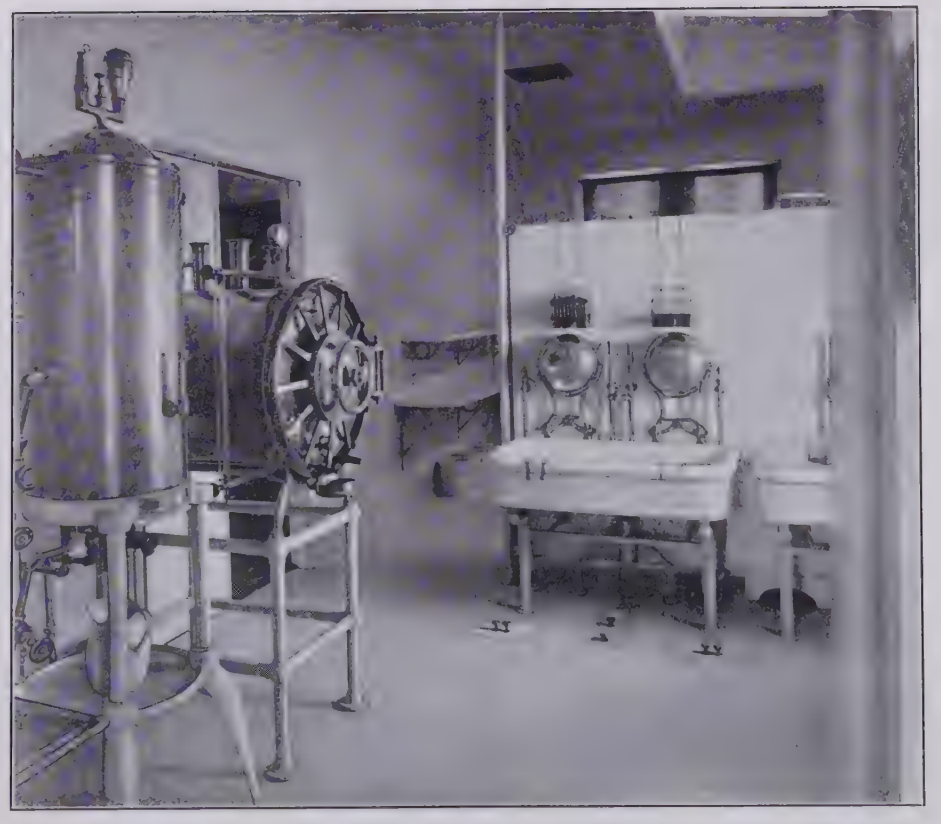

FIG. 4.—Sterilizing-room. Foot-pedals to control water, devised by Dr. Hunter Robb and first used here.

be conveniently arranged by plaiting in two long braids. The operating-table is covered with a blanket protected by a sterilized sheet, and upon this the patient is placed in the position required by the operation.

Post-operative Enemata.—In order to prevent, as far as possible, the distressing thirst which is the commonest of the discomforts following operations, a rectal enema of one litre of normal salt solution is given while the patient is still on the operating-table.

Anæsthetics.—The patients are all primarily anæsthetized with nitrous oxide and then given ether. In minor operations upon the vagina and cervix, in dilatation and curettement, in simple examinations under anæsthesia, and in all the bladder work, nitrous oxide is alone used, supplemented by oxygen when necessary. Quite recently in several cases with diseased hearts and arteries major operations lasting upward of an hour, such as nephrectomy, have been performed under the influence of nitrous oxide and oxygen. Too much stress cannot be laid upon the constant use of nitrous oxide gas as an anæsthetic for minor operations and preliminary to the use of ether. Nothing which has come into my surgical practice of late years has given me quite so much satisfaction. All the distressing choking, coughing, and struggling are done away with, and the patient returns to consciousness afterwards without any nightmare regarding her anæsthetization. In addition the post-operative nausea is almost a thing of the past. The surgeon also is saved from twenty to thirty minutes' waiting. I also not infrequently give gas in my office to examine patients who need a deep pelvic examination but who cannot remain longer than half an hour or an hour.

Outside Work.—Another great convenience of the private hospital is the facility with which all preparations are made for any outside work the surgeon may be called upon to do. The operating-room nurse keeps the kits of instruments and dressings in constant readiness to respond to an urgent call, and also holds herself or an assistant ready to go with the surgeon wherever he may be summoned. Sometimes the nurse can be sent ahead to make all preparations at the house, and the surgeon follows later and arrives in time to begin the operation as soon as preparations are made.

In the case of very ill patients who dare not travel and emergency cases in which moving would be dangerous, operations are

done in private houses. For such purposes an entire outfit of instruments, dressings, dishes, and every accessory that one could possibly need for any kind of operation, is always kept packed and ready for immediate use. Everything is previously sterilized and packed in large canvas telescope bags to facilitate handling. A portable operating-table devised by Dr. George Edebohls is packed in a neat canvas case and forms a necessary addition to the travelling kit. An assistant usually carries an additional case containing a microscope and all the necessary apparatus and reagents to make a complete analysis of the urine, blood, or uterine scrapings if such investigations should be needed. The articles always taken in the kit for outside operations, beside the necessary instruments, are four nail-brushes, sterilized and wrapped in gauze; soap in a metal box; tablets of bichloride of mercury (five grains each); tablets of sodium chloride; two ounces of oxalic acid in a bottle; two ounces of permanganate of potassium in a bottle; brandy, eight ounces; alcohol, eight ounces; iodoform and boric acid powder (one to seven); razor in case; ether and cone, chloroform and mask; hypodermic needle, with hypodermic tablets of strychnine (one-fortieth of a grain) and atropine (one-hundredth of a grain); gauze (two large, two medium, and four small pieces in package); twelve sterilized towels in bag; seven sponges in two jars; iodoform gauze; one package of absorbent cotton (six pieces); irrigation bag, with tube and glass nozzle; ovariotomy pad; abdominal bandage; storage battery and headlight; two porcelain-lined hand-basins; rubber gloves, sterilized in the soda solution with the instruments and put in a linen bag; two rubber sheets; duck suits and canvas shoes for surgeon and assistants; safety-pins. To this list may be added the gas cylinder and bag.

Clinical Laboratory.—A clinical laboratory, containing all the necessary apparatus for making a thorough chemical, microscopical, and bacteriological examination of the secretions or excretions necessary for diagnosis, has come to be an indispensable adjunct to a properly equipped private hospital. Microscopical examinations of the secretions from the uterus, cervix, vagina, Bartholin's glands, Skene's ducts, urethra, and vulva, often give important information concerning the nature of the infection and the cause of an existing disease. Such examinations are made in every case of pelvic inflammatory disease and a careful record is kept of the

bacteriological findings. Let me, for example, cite a recent case. A patient had some vague thickening of one of the upper lobes of the right breast. The area was excised and cut open and to the naked eye appeared simply to consist of some atrophic gland tissue. While I was sewing up the wound, however, a frozen section hardened in formalin (Cullen's method) was examined in the clinical laboratory, and by the time the wound was closed the report of the microscopic examination showed that the disease was, contrary to all expectation, a deep-seated adenocarcinoma. The complete extirpation of the breast, the axillary glands, and the pectoral muscles followed.

The urine of every patient is frequently examined, both before and after operation, and the results are tabulated on charts kept especially for the purpose, the wording of which follows.

URINE CHART.

Name. MIXED URINE. *Date.*
Catheterized—voided Amounts in 24 hours
PHYSICAL CHARACTERS.
Color
Odor
Reaction
Sediment
CHEMICAL TESTS.
Albumin
Sugar
Urea test grms. in one cc. Calculated amount in 24 hours
MICROSCOPIC EXAMINATION.
Cells
Casts
Crystals, etc.

SEPARATED URINES.

Right Kidney or Ureter. *Date of Exam.*
Amount, cc. in minutes. Estimated amount per diem
Physical characters
Chemical tests Estimated urea per diem
Urea
Microscopic examination
Notes
Left Kidney or Ureter. *Date of Exam.*
Amount, cc. in minutes. Estimated amount per diem
Physical characters
Chemical tests Estimated urea per diem
Urea
Microscopic examination
Notes

In suspected unilateral kidney disease especial attention must be paid to the study of the separated urine obtained by means of direct catheterization of the ureter. In the numerous infections of the genito-urinary tract, a careful bacteriological examination of an uncontaminated specimen of urine will often show the true cause of the disease, such, for example, as the colon bacillus, gonococcus, and tubercle bacillus.

The blood of every patient is carefully examined upon admission and at frequent intervals during convalescence. In cases where the hæmoglobin registers thirty per cent. or lower, operative procedures, except in emergency, are deferred until the blood examination shows improvement. The stomach contents, fæces, and sputum are examined when occasion requires and the reports filed with the history of the patient. The uterine scrapings obtained by curettage are all examined microscopically for diagnostic purposes, to differentiate between endometritis, carcinoma, tuberculosis, and simple glandular hyperplasia, as the case may be.

X-Rays.—The X-ray room is a small apartment adjoining the operating-room. The instrument used consists of a fifteen-inch spark coil, which derives its current from seven storage cells, each of an electromotive force of two volts. The tubes are made by Queen & Co., of Philadelphia, and are of the self-regulating type. Besides the X-ray room there is a dark room for the development of plates, etc. This work has been done especially in connection with renal and vesical calculi, and in a considerable number of the cases diagnosed by means of the X-rays the diagnosis has been subsequently corroborated by operation.

Nurses.—The nurses are selected from the humane rather than the scientific stand-point, and the result proves that both qualifications may be found together. One great difficulty of all large hospitals, that of the constant change of nurses, continually bringing new faces before the patient, is avoided by having the same nurses always in charge. It is also possible in the smaller hospital to seek to adapt the nurse to the patient, so that often a warm friendship springs up between them.

The nursing staff is under the direct management and control of one head nurse and general superintendent of the sanatorium. All nurses are graduates of experience or have had a full course of training of three years. While a training-school would effect a

large economy, it would not be just to the nurses on account of the limited field of experience. The system adopted in the hospital provides one nurse for every two patients during the day and one nurse for every six patients during the night. Operative cases always have an especial nurse to care for them until the immediate dangers of the operation are over; patients very ill or those requiring constant attention and watching often need one or more special nurses. The usual hours for the nurses are from 7.45 A.M. to 7.30 P.M., with one hour recess; each nurse has an afternoon off duty once a week and two hours every Sunday. The number of ordinary nurses employed at the sanatorium averages about twenty-five; with the two in the operating-room, an office nurse, and two masseuses, we have in all some thirty nurses.

Care of the Wound.—In perfectly clean wounds free from infection the dressings are not disturbed (unless some special indication requires their removal) until the tenth day.

Post-operative Treatment.—I would like to emphasize one point in the post-operative care of my patients which might at first sight seem trivial, and that is the way in which the catheterization is managed. Serious results not infrequently follow unskilled efforts to do this little operation in training-schools, and far more serious are the consequences when any one of half a dozen nurses may be responsible. In my private hospital the graduate nurse is trained to catheterize with as much care as to technic as though she were performing an operation. She not only exposes and cleanses the orifice thoroughly but also puts on sterilized rubber finger-tips to handle the catheter. One nurse and one alone is responsible in all perineal operations, getting up at night and irrigating the stitches and catheterizing whenever necessary. Since thus placing the entire responsibility upon one pair of shoulders I have had no infections following perineal surgery. As bacteriological studies are made of uncontaminated specimens of urine both before and after operation, any infection then found which did not exist before could be promptly detected and the blame placed upon the proper person.

The patients' food is prepared in the general kitchen and carried to their rooms. Small diet kitchens in each house and on every floor are provided for the preparation of delicacies or special diets.

Rest in Bed.—A patient upon whom a major abdominal section has been performed must remain in bed from eighteen to twenty-

one days; she may then be permitted to sit in a reclining-chair for several days, and then gradually, as her strength increases, she may return to her customary manner of living. Patients upon whom plastic operations have been performed are kept in bed for about two weeks. Before being allowed to walk, the patients are fitted with snug-fitting binders, which they must wear for a period of several months or longer, according to the condition of their abdominal muscles.

Massage.—Massage is extensively used as a necessary auxiliary in the treatment of nearly all the cases, and two trained women are constantly employed.

Salaries.—The regular nurses who remain a year have been paid from thirty-five dollars to forty dollars a month. The salaries of all the regular nurses and of the superintendent, operating-room nurses, and masseuses bring the total cost of the nursing department to a little over nine thousand dollars a year.

Laundry.—The general laundry work is done outside in one of the city steam laundries; the operating-room linen, all table-linen, and nurses' laundry are done in the house by a chief laundress with five assistants.

Records.—The histories are taken by filling out blanks devised especially for the purpose, the wording of which is annexed.

HISTORY SHEET.

1414–1418 Eutaw Place. Admission No.

Name, Date of admission,
Residence, Date of discharge,
Age, S. M. W. Patient of Dr.
Diagnosis:
Operation,
Marital history. No. years married, Para., Mis.,
Labors,
Menstr. history,
Gen. appearance,
Blood-examination,
Weight,
Sleep,
Leucorrhœa,
Headaches,
Heart,
Family history,
Lungs,
Stomach,
Bowels,
General previous history,
Kidneys,
Bladder,
Development of present condition,

These history sheets are carefully preserved, and after the patient's discharge they are bound, with the other clinical reports and nurses' charts pertaining to the patient's stay in the sanatorium, in volumes of twenty-five cases each, and locked away for future reference.

Outline of Proposed Treatment.—In order to avoid pursuing an aimless or indefinite plan of treatment, an outline of the course to be prescribed is made in every case entering the sanatorium. This outline comprises the results of the first consultation and examination, together with the operation proposed, should one be

OUTLINE OF PROPOSED TREATMENT.

Name. *Date.*

PRELIMINARY INVESTIGATION OF
- Chest
- Digestion
- Urine
- Kidneys
- Blood

OPERATIONS:
- Abdominal
- Pelvic
- Appendix verm.
- Renal
- Cervical
- Rectal
- Breast

REMARKS:

necessary. Under "Preliminary investigation" notes are made concerning such features as seem to require special attention. As a rule, the history of the patient has brought out good reasons for a particularly careful study of some organ or organs, which is emphasized in this way. This chart is handed to the nurse in charge of the patient upon her admission to the sanatorium; copies are made and given to the resident physician, the superintendent, and the nurse in charge of the operating-room. As soon after the patient's admission as possible, a thorough medical examination is made by one of the associates, embracing a physical investigation of the thoracic and abdominal viscera and an analysis of the blood and urine, and the result of these examinations, together with an abstract of the patient's entire history, is filled out by the associates who make them.

Résumé Chart.—These *résumés* (see chart) afford a means of readily ascertaining the exact condition of all patients at the time of admission and during their stay in the sanatorium, without the effort of memorizing an enormous number of data.

RÉSUMÉ CHART.

OUTLINE ANALYSIS, FOR READY REFERENCE.

Name. *Date.*

Summary of history:

	Sp. Gr.	Reaction.	Alb.	Sugar.	Microscopical Findings.
Urinalysis, V.					
C.					

Blood, Hæm., Leuc.,
Stomach, Position, Analysis,
Pulse,
Heart,
Lungs, Liver, Spleen,
R. kidney, Position, Size, Infection,
L. kidney,
Urethra,
Verm. append.,
Bladder, Mucous memb., Trigonum, Uret. o. Capacity, Infection,
Rectum,
Colon,
Vaginal outlet,
Vagina, Secretion,
Cervix, Secretion,
Uterus, Position, Size, Mobility,
Uterine tubes, Ovaries,
REMARKS:

Signature,

Terms.—The expenses incurred by patients for their professional services range from seventy-five to one hundred and fifty dollars per week. These charges include medical attention, nursing, and whatever treatment, special or general, may be needed; the weekly charge does not include the fee for operation, which is adjusted, as a rule, upon the entrance of the patient.

Cost of Maintenance.—The total running expenses of such an institution average about forty thousand dollars per annum. The chief incidentals for the season of 1900-1901 were as follows:

Assistants	$1800	Fuel	$1000
Nurses	9000	Medical and surgical supplies	4000
Domestics	5000	House furnishings, improvements, and repairs	5600
Housekeeper	600	Incidentals	1000
Provisions and groceries	12,500		
Lighting (gas and electricity)	1000		

My office hours, which I used to keep three times daily,—in the morning, in the early afternoon, and at night,—are now replaced by consultation hours on Tuesday and Thursday from nine to one o'clock, leaving the rest of the week free for other duties. There is no doctor's sign at my private dwelling, which is completely detached from any association with my professional services. My work, which at one time took me widely afield to see patients, is now centralized in the Johns Hopkins Hospital, where there are accommodations for from eighty to ninety gynæcological cases, and in this private hospital, capable of holding about thirty patients.

One great difficulty in most private hospitals, that of a poorly arranged operating-room, I have overcome by the newly erected detached building with an equipment equal to any other operating-room anywhere. Operations are performed, as a rule, on Tuesday and Thursday afternoons; in this way, by having definite times for operating, the operating-room nurse is able to systematize her time, to keep up her supplies, and to aid in the bladder treatments which often take several hours each day.

The advantages of such a private hospital are manifold. In the first place, it has been my aim, in adapting large, comfortable dwelling-houses to my purpose, to eliminate entirely the feeling which is attached to a regular hospital. The patient enters her own room, with open fire and furniture and rugs and comforts of all kinds, and, with pictures and various little articles she has brought with her, makes it look as home-like as possible. While routine is necessary in all large institutions, in the private hospital it is subordinated, as far as the patient is concerned, to her whims, so that her hours of rest and diet are, as far as it is wise to permit it, under her own control. She is also more isolated, and may leave her room to take a sun-bath or airing on the bridge, or to go out riding, and then on coming back to her apartment, as a rule, knows little or nothing of what has been transpiring in neighboring rooms.

THE FUNCTION OF THE DIGESTIVE GLANDS, BASED ON THE RESEARCHES OF PAVLOF AND HIS PUPILS.[1]

A SPECIAL PAPER PREPARED AT THE REQUEST OF DOCTOR PAVLOF, PROFESSOR OF EXPERIMENTAL MEDICINE AT THE IMPERIAL INSTITUTE OF ST. PETERSBURG, RUSSIA.

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PART I.

INTRODUCTION.

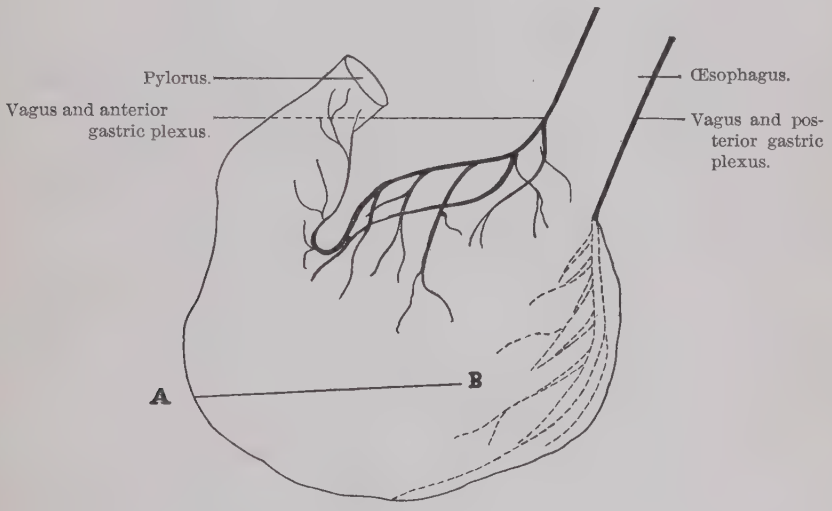
The invention of new methods in scientific research generally results in a series of more or less important discoveries, and many recent improvements in operative technic are due to the fruitful laboratory activity of Professor Pavlof. Formerly the majority of physiologists used the so-called rapid methods almost exclusively; Professor Pavlof, realizing the inaccuracy of such experiments, directed his attention to the use of animals whose physiological functions were kept under as normal conditions as possible. This new departure led to experiments with chronic fistulæ. As a result of methods formerly used many fistulæ shrank and healed, and in order to avoid this healing it was necessary greatly to modify the technic of the operation. He introduced the method of sewing the duct with its natural opening into every wound of a gland. In this manner, in a fistula of the salivary gland a small piece of mucous membrane from the oral cavity is sewed in where a duct terminates, while in a fistula of the pancreas or of the stomach a portion of duodenum is used. Permanent fistulæ were produced in dogs by this method, and the importance of this modification was demonstrated by the increased facility in observing the secretion of bile in biliary fistulous tracts. Previous to this time fistulæ in the gall-bladder made it possible to observe the formation of the bile

[1] Translated from the Russian by Robert Formad, M.D.

by the liver, but did not afford a view of the bile flow into the duodenum. The fenestral operation method, presenting a view of the gland tracts with their natural openings, served as a means of acquiring valuable data concerning the secretion of these glands under normal conditions of digestion, and suggested material alterations in existing methods of operative technic.

The first place among these operations should doubtless be accorded to œsophagotomy, throwing light, as it does, upon the psychical secretions of the stomach and enabling the physiologist to obtain pure gastric juice. The main steps in this operation are as

FIG. 1.

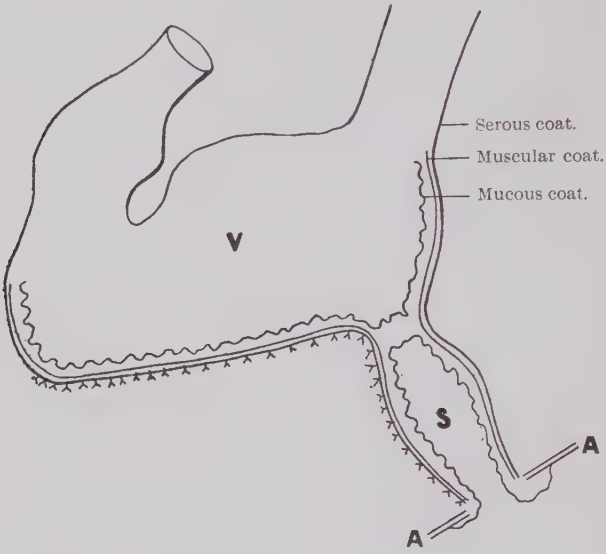


A, B, incision adopted by Pavlof to avoid disturbing the vagi.

follows. In a preliminary operation, a fistula is made in the stomach of a dog; later on the œsophagus is exposed, cut in half, and the two ends are sewed to the lips of the wound. When the dog is fed, all the food drops from the upper segment of the œsophagus and nothing reaches the stomach; but the secretion of the gastric juice begins in from five to six minutes. After thus establishing a psychical flow of the gastric juices and studying the action of the glands from every stand-point, Professor Pavlof found that the method used by Heidenhain to obtain a separate small, isolated stomach from the regular stomach failed to yield a true picture of the psychical secretion, for when the dog is fed the secretion from

the small stomach is found to be not identical with that from the large one. He, therefore, modified Heidenhain's method by making the incision through all the walls of the stomach in the direction of the pneumogastric nerve, without disturbing the latter, and utilizing the mucous membrane of the stomach to form the walls of its smaller counterpart. (Figs. 1 and 2.)

Fig. 2.



V, cavity of the stomach; S, isolated surface; A, anterior abdominal wall.

By these modifications he succeeded in getting an isolated, small stomach which functionated in unison with the larger one, while the quantity of gastric juice secreted was found to be proportionately less. The examination of the digestive juices secreted after the ingestion of many varieties of food disclosed the fact that there was a remarkable tendency to adjust each juice, in consistency and composition, to the character of food taken. This further led to the discovery in chyme of a specific ferment, chymaze, which does not digest food but which accelerates the action of the ferment of the pancreatic secretion. These facts were obtained only after an extensive series of experiments on the separation of the stomach from the duodenum, the making of the small, isolated stomach from various parts of the stomach proper, the production of fistulæ in the bottom of the stomach, duodenum, and even lower down in the

alimentary tract, and the isolation of various parts of the intestines after the method of Thiry.

As the success of the investigations and the accuracy of the observations depend largely upon the physical condition and the psychical excitement of the animals employed, careful attention is given to these features. Each dog is weighed at 6 A.M. daily, and at the same time the temperature is taken. Later the dogs are exercised, and at stated times fed. The quantity and quality of the food depend upon the animal and the character of the operation, as well as upon the character of the pending experiment. The experiments are carried on only upon animals in good health, except, of course, where animals intentionally are made sick. The observations are carried on in separate rooms to which outsiders are denied access; and the dogs are frequently so accustomed to the process that they jump on the table of their own accord and often sleep during the experiments.

In order to eliminate the psychical effect of the sight and odor of food the latter is prepared in a separate room and is not brought in until the time for feeding actually arrives. The experiment usually begins with a period of rest of the digestive glands, and if the dog has any juices secreted as a result of psychical excitement it is necessary to await the subsidence of this secretion. The observations usually continue until there is practically complete cessation of secretion.

Before proceeding to describe those facts obtained in the experiments of determining the quantity of the outpoured secretion upon the food, it will be well to say a few words on the method of determining the digestive strength of these juices themselves.

In the investigation of the digestive power of the several juices upon albumen, the method of Mett was used; this procedure was worked out in the Pavlof laboratory, and is as follows: Glass test-tubes, from one to two millimetres in diameter, are filled with the white of a hen's egg coagulated at 95° C.; these cylinders of coagulated albumen are cut into pieces one or two centimetres thick and placed in the juices to be tested, after which the tubes containing them are placed in an oven with a thermostatic range from 37° C. to 38° C. for ten hours. On removal the contents of the tubes are examined under a low magnifying power, and a calculation is made according to the polariscopic method of Drs. Borissof and Schütz, by

which it is reckoned that the square of the rapidity of digestion of the albumen is in direct proportion to the percentage of ferment contained in the solution. Thus, if in one fluid two millimetres were digested, while in another, under similar conditions, three millimetres were digested, the percentage of ferment in these fluids would be $2^2:3^2$ or as 4:9. The truth of this law for pepsin was demonstrated by Walter, and has also been proved regarding the trypsin diastatic ferment and oleopepsin. In determining the power of the diastatic ferment this method may be used after filling the test-tube with starch paste, or the quantity of sugar may be determined by volumetric analysis. In determining the power of oleopepsin, titration with caustic barium is used exclusively, as a simpler method has not so far been devised.

SALIVARY GLANDS.

Prior to Pavlof's investigations our knowledge of the action of the salivary glands was more complete than that of the action of other digestive glands; at the same time, certain features connected with their activity were not understood. We knew the innervation of the salivary glands. We knew that saliva is secreted during the ingestion of food, and we even knew from every-day experience that simply the thought of food will sometimes induce a flow of saliva; but the etiological factors back of these phenomena were not known.

A series of typical experiments performed in Pavlof's laboratory tends to make clear some of the facts elicited in this connection. If we take a dog with a fistula of the parotid gland and observe the flow of saliva during the ingestion of various foods, we find that during the eating of raw meat, which the dog relishes greatly, there is no saliva; if dried, powdered meat be given, saliva is secreted in large quantities. In the feeding of biscuit, the latter result is also obtained. From this it would appear that the secretion of saliva from the parotid gland is not regulated by the appetite nor by the need of mastication, but rather by the degree of dryness of the food. But this is not the only exciting factor in connection with the parotid secretion. If we give the dog some small, clean stones, there will be no saliva, even though he may attempt to chew them from force of habit; if we place sand in the mouth, there will be a great excess of watery saliva; and if we introduce a weak acid, as a half per cent. of hydrochloric acid, a large quantity of turbid saliva is

secreted. If we acidulate the saliva derived from the experiment with sand, we obtain only an insignificant turbidity, while acid renders the albumen flaky.

The results of these experiments give us a clearer insight into the further objects of the salivary secretion, proving that these include the washing or rinsing of the mouth to remove foreign substances and the dilution of certain harmful materials. Thus, in the case of small stones there is no necessity for saliva, and consequently there is none. The removal of sand from the mouth is impossible without saliva, and we find here an abundant quantity and very watery. In the case of acid, which is not harmless like sand, the functions of the saliva are two in number,—the dilution of the injurious substance and its neutralization as far as possible. In this case, therefore, there is a great deal of saliva secreted and it contains a quantity of albumin.

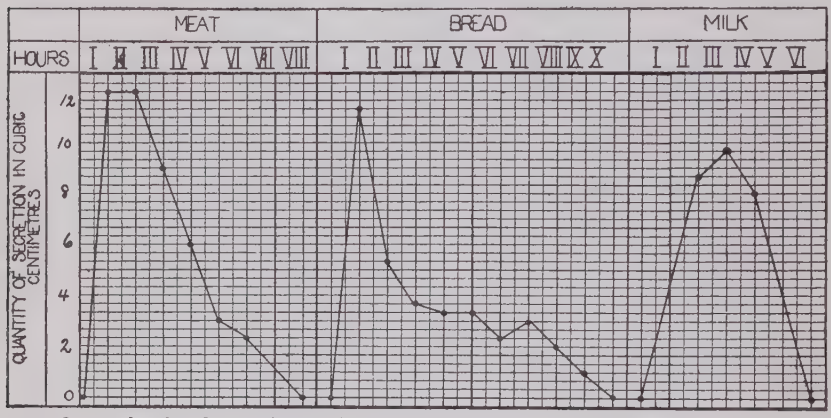
If we take a dog with a fistula of the submaxillary gland and feed him with raw meat, we notice the appearance of a small quantity of thick saliva. If sand is placed in the mouth of the same dog, the saliva will be copious and watery. This watery secretion is found in connection with the necessity of rinsing the mouth free from foreign substanees; but a thick secretion appears in the case of eatable things, where a proper degree of lubrication will facilitate the passage of the material to the stomach. Saliva, then, moistens the food if it is deficient in moisture, rinses the oral cavity, dilutes injurious substances and to some extent neutralizes them.

Thus we find the salivary glands acting harmoniously and capable of adapting the secretions to various needs of the organism, and the questions arise, What influences are back of this selective process? Do we have here a simple reflex action of the oral cavity, or is the phenomenon a complex one? Is the psychical condition of the animal also involved? These questions may be quite definitely answered by simply showing the substances to the dog instead of placing them in his mouth. Upon showing raw meat to the dog, there will be practically no secretion by the parotid gland. Only from one to two drops will appear when he is shown powdered meat, but when biscuits are shown the secretion will be much increased. If sand be shown to a dog, which has on former occasions had sand introduced into his mouth, the secretion will be abundant and watery. From these experiments it is clear that secre-

tions may be stimulated which will prepare the oral cavity for the reception of food even before such food is administered.

The Stomach.—In order to note the activity of the stomach under normal conditions of digestion it is well to make use of a dog

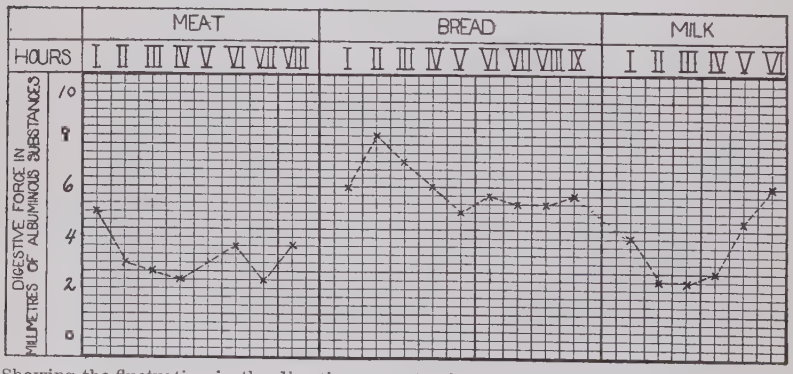
FIG. 3.



Curves showing the gastric secretion during the ingestion of meat, bread, and milk.

in which a small, isolated stomach with a fistula has been made from the large stomach, following the method of Heidenhain as modified

FIG. 4.



Showing the fluctuation in the digestive property of the gastric juice in hour ratios during the ingestion of meat, bread, and milk.

by Pavlof. As we avoid cutting the pneumogastric nerve, we find from examining the secretions of the small stomach what processes are taking place in the large one. Several methods may be used to convince us that the small stomach is really a reflector of the large one. If the dog has a fistula in the large stomach as well as its small

one, after feeding him pieces of meat with strings attached to them, these pieces may at any moment be removed from the larger pouch and the conditions of digestion observed in both stomachs simultaneously. A series of experiments of this character yield convincing results, indicating not only that the secretion is similar, but also that the quantity is proportionately less in the small stomach than in the large one.

The question now arises, Is there any relation existing between the amount of food partaken of and the quantity of gastric juice secreted? Dr. Chigen has demonstrated the existence of a direct proportion. For instance, when one hundred grammes of meat were given, the small stomach secreted twenty-six cubic centimetres; with two hundred grammes, forty cubic centimetres were collected; and for four hundred grammes there were one hundred and six cubic centimetres. When mixed food was given, consisting of three hundred cubic centimetres of milk, fifty grammes of meat, and fifty grammes of bread, forty-two cubic centimetres of secretion were collected. When double the quantities of the mixed food was taken, the secretion amounted to 83.2 cubic centimetres.

As to the influence that the character of the food has upon the composition of the secretion, the following table gives some information. (See also Figs. 3 and 4.)

AVERAGE RESULTS OBTAINED BY CHIGEN FROM THE INGESTION OF TWO HUNDRED GRAMMES OF MEAT, TWO HUNDRED GRAMMES OF BREAD, AND SIX HUNDRED CUBIC CENTIMETRES OF MILK.

Quantity of Secretion in Cubic Centimetres.				Digestive Force in Millimetres.		
Hours.	Meat.	Bread.	Milk.	Meat.	Bread.	Milk.
1	11.2	10.6	4.0	4.94	6.10	4.21
2	11.3	5.4	8.6	3.03	7.97	2.35
3	7.6	4.0	9.2	3.01	7.51	2.35
4	5.1	3.4	7.7	2.87	6.19	2.65
5	2.8	3.3	4.0	3.20	5.29	4.63
6	2.2	2.2	0.5	3.58	5.72	6.12
7	1.2	2.6	....	2.25	5.48	....
8	0.6	2.2	....	3.87	5.50	....
9	....	0.9	....	...	5.75	....
10	....	0.4	....	....	....	....

There is clearly a marked difference in the behavior of the gastric glands in the presence of various kinds of food, and this difference is manifested in the character and composition of the secretion together with its quantity and duration. We may thus designate a bread-diet secretion, meat-diet secretion, and milk-diet secretion. In the case of bread the secretion continues for ten hours, with meat for eight hours, and with milk for six hours. The character of the secretion is specific: with meat we have the largest quantity of secretion during the first two hours, with bread we have the maximum during the first hour, and with milk during the second and third hours. The digestive action is greatest in meat during the first hour, in bread during the second and third hours, and in milk during the last hour. The highest degree of acidity is found in connection with meat ingestion, .56 per cent. of hydrochloric acid, and the lowest with bread, .46 per cent. of hydrochloric acid.

Proceeding to draw logical conclusions from the facts cited, we will first determine whether the psychical condition of the animal plays any part in the gastric secretion, and, if it does, what that part is. The œsophagus of a dog is cut and its ends are sewed to the edges of the wound, leaving a gastric fistula. Pieces of meat are now fed to the dog and they will fall out from the upper end of the œsophagus. In five or six minutes the gastric secretion begins, at first appearing in drops and later in a stream. If the dog be given small stones instead of meat, there will be no secretion following the attempt to masticate and swallow, suggesting that the acts of chewing and deglutition are not the fundamental factors in this secretion. A dog in this condition may be offered meat without receiving it, and the gastric secretion will appear, though not so plentifully as if the dog actually ate the meat. As the psychical secretion began five minutes after the feeding commenced and continued only during eating and a short while after, gradually diminishing and never continuing for several hours without food, while we bear in mind that the ingestion of bread was followed by secretion for ten hours, we naturally have to search for other reasons for the secretion of gastric juice.

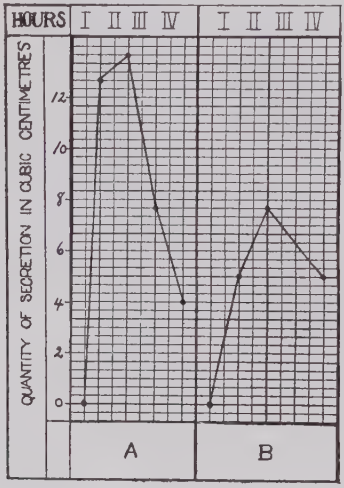
Many of the older authors believed the mechanical irritation of food to be the cause of gastric secretion, but experiments in Pavlof's laboratory have proved conclusively the fallacy of that view. Continuous irritation with the point of a glass rod, with a feather, or

with sand does not give a drop of secretion. The mistake of former experimenters grew out of the fact that they were ignorant of the psychic secretion, and hence took no precautions to keep the sight and smell of food from the dog, neglecting in that way the psychical secretions. The specific composition of every secretion suggests the direction in which we should look for the explanation of gastric secretion. If with every kind of food a definite secretion is formed, it is clear that the body provides a certain chemical agent to meet each case. A dog was taken which had a small, isolated stomach with a fistula as well as a fistula in the large stomach. Into the large stomach was poured some beef broth or Liebig's extract in such a way that the dog did not see it. Within fifteen minutes the flow of gastric juice in the small stomach began. The fistula in the large stomach was then opened and the remaining broth removed, after which the secretion in the small stomach gradually diminished until it completely ceased. To determine the question as to whether the secretion of gastric juice is due to absorbed substances or simply to irritation of the mucous membrane, some of the broth was placed in the intestine and no secretion followed. We must, therefore, conclude that the mucous membrane of the stomach distinguishes between the varieties of food that come in contact with it, just as the skin recognizes heat, cold, and touch.

Having established the existence of two kinds of gastric secretion, psychical and chemical, we can determine the functions of each. To a dog with a gastric fistula we may give fresh meat either without showing it to him or after letting him see it, and we find great differences in the rapidity of digestion. Lobasof placed twenty-five pieces of meat (one hundred grammes) in the stomach of a dog without letting him see it, and found that in two hours 6.5 per cent. had been digested; then, after tantalizing the dog with the meat for six minutes, he placed the meat in the stomach and found that 31.6 per cent. had been digested after two hours. But even more noticeable are the results of the following experiment. If a solution of albumen be administered, there will be no secretion in the small stomach, as this material does not excite chemical secretion; but if secretion be stimulated by some other means before the albumen is placed in the large stomach, then following its introduction we will find secretion in the small stomach. It follows that if the albumen does not excite secretion, the products of digestion

of this material do cause this secretion. Pieces of bread placed in the stomach do not promote secretion, whereas if swallowed by the dog, secretion commences and continues for several hours. (See tables above.) The influence of the psychical secretion can be clearly seen by a reference to the curves shown below (Fig. 5).

Fig. 5.



In A, two hundred grammes of meat have been eaten by the dog. In B, the test-meal of one hundred and fifty grammes has been placed in the stomach.

We have seen that Liebig's extract and the products of albuminous digestion excite chemical secretions; but that this function is not exercised by the albumen itself, other similar experiments show that water promotes gastric secretion in but a limited degree, and that solutions of sodium chloride and starch and infusion of bread have no more effect than water. A solution of sodium chloride, one-half to one per cent., and fat appear to interfere with the secretory process. The influence of fat is well shown by an experiment made by Lobasof. A dog upon which œsophagotomy had been performed, and in which the operation wounds had fully healed, when fed with meat for six minutes gave the following results for the small stomach:

Hours.	Quantity of Secretion.	Digestive Power.
1	4.0 c.c.	
2	1.0 c.c.	. . . . . 4.75 mm.
3	.5 c.c.	

Under precisely the same conditions a dog was given one hundred cubic centimetres of olive oil along with the food, and during two hours not a drop of secretion appeared.

Similar results are observed when we compare the effects of milk diet and cream diet.

600 C.C. Milk.

Hours.	Quantity of Secretion.	Digestive Power.
1	4.2 c.c.	3.57 mm.
2	12.4 c.c.	2.63 mm.
3	13.2 c.c.	3.06 mm.
4	6.4 c.c.	3.91 mm.
5	1.5 c.c.	7.37 mm.
6	. . .	. . .
7	. . .	. . .
8	. . .	. . .
Total.	37.7 c.c.	

600 C.C. Cream.

Hours.	Quantity of Secretion.	Digestive Power.
1	2.4 c.c.	2.1 mm.
2	3.4 c.c.	2.0 mm.
3	3.1 c.c.	2.0 mm.
4	2.2 c.c.	1.75 mm.
5	2.2 c.c.	2.0 mm.
6	1.8 c.c.	1.38 mm.
7	2.5 c.c.	1.88 mm.
8	1.3 c.c.	1.62 mm.
Total.	18.9 c.c.	

200 Grammes Bread.

Experiment by Dr. Chigen, May 25, 1894.

Hours.	Quantity of Secretion.	Digestive Power.
1	11.9 c.c.	5.22 mm.
2	4.1 c.c.	8.25 mm.
3	5.7 c.c.	6.69 mm.
4	4.5 c.c.	3.56 mm.
5	4.1 c.c.	3.62 mm.
6	1.6 c.c.	4.80 mm.
7	1.8 c.c.	5.50 mm.
8	0.8 c.c.	5.62 mm.
9	0.6 c.c.	. . .
Total.	35.1 c.c.	

Combination of 100 Grammes Starch, 100 Grammes Meat, 150 C.C. Water.

Experiment by Dr. Lobasof, May 10, 1895.

Hours.	Quantity of Secretion.	Digestive Power.
1	13.5 c.c.	7.88 mm.
2	11.0 c.c.	7.00 mm.
3	8.9 c.c.	6.13 mm.
4	4.9 c.c.	5.63 mm.
5	4.3 c.c.	5.0 mm.
6	1.9 c.c.	6.5 mm.
7	1.2 c.c.	6.0 mm.
8	. . .	. . .
9	. . .	.
Total.	45.7 c.c.	

If we separate the fat from the milk and give the latter to the dog, we get a larger quantity of secretion during the first hours and more vigorous action generally. (Experiment of Volkovitch.)

The previous experiment upon a dog which had been subjected to œsophagotomy indicated that the retardation of the gastric secretion was due to the presence of fat, and depended on the inhibiting reflexes of the gastric mucous membrane. In this experiment there can be no question as to the tendency of the fat to coat the mucous lining of the stomach, and we cannot claim that the food weakens the chemical excitability in any other way. If the experiments with

ordinary milk, with cream, and with milk deprived of fat, explain the influence of fat on gastric secretion, they also suggest the cause of the differing gastric secretions in the presence of various foods. The accompanying table shows that in bread ingestion a larger quantity of gastric juice is secreted than in the case of a meat regimen, and it will be of interest to determine what influences the quantity of secretion. If we mix meat and starch paste in the same proportion as exists between albumen and the starch in bread, and give this mixture to a dog, we find that the secretion has the high digestive power of that following bread ingestion.

Hours.	In this experiment Chigen gave the dog two hundred grammes of meat to eat.		Results obtained by Lobasof from placing one hundred and fifty grammes of meat in the stomach through the fistula.	
	Quantity of secretion in cubic centimetres.	Digestive force in millimetres.	Quantity of secretion in cubic centimetres.	Digestive force in millimetres.
1	12.4	5.43	5.	2.5
2	13.5	3.63	7.8	2.75
3	7.5	3.5	6.4	3.75
4	4.2	3.12	5.	3.75

This discloses a new and important fact concerning the action of the gastric glands. We have previously seen that starch paste does not by itself promote gastric flow: now we find that when mixed with meat it can in some way influence the action of the gastric glands, increasing their digestive power, while the addition of fat to a meat diet diminishes the quantity of gastric secretion as well as its digestive power. From the above facts it is evident that the mucous membrane is extremely delicate in detecting the composition of foods and that the composition of the gastric secretion corresponds with the ingested food.

The placing of Liebig's extract in the rectum does not promote gastric secretion, and this suggests that the reflex activity of the glands does not extend along the entire gastro-intestinal tract. As to which part of this tract is more sensitive and which foods cause the most prompt response, the following experiment may yield some information. A dog was taken which had a fistula of the large stomach, and isolated small stomach, and a fistula of the duo-

denum, the duodenum having been obliterated by a wall of the duodenal mucous membrane. Meat juice and other substances were poured alternately into the stomach and then into the duodenum, and it was found that the larger elaboration of gastric secretion took place in the small isolated stomach following the placing of the broth in the stomach rather than into the duodenum. The inhibitory influence of fat was apparent only when it was conveyed into the duodenum, and not into the stomach. It was also possible to establish a self-regulating influence in the gastric secretion,—namely, to observe the inhibitory influence in the elaboration of gastric juice dependent in its secretion. If we pour into the stomach of the dog six hundred and ten cubic centimetres of water, we obtain secretion during the first hour of 6.6 cubic centimetres, during the second hour of 4.5 cubic centimetres, and during the third hour of 6.6 cubic centimetres. When instead of water a half per cent. solution of hydrochloric acid was used, the secretion during the first hour was nothing and during the second it was six-tenths of a cubic centimetre. Such inhibition on the part of accumulated gastric juice may also be observed in the following experiments. (1) If there were poured through the fistula of the large stomach one hundred grammes of meat and five hundred and ten cubic centimetres of water, the secretion in the small stomach was found to be: first hour, 12.2 cubic centimetres; second hour, 13.6 cubic centimetres; third hour, 8.2 cubic centimetres. (2) If there were given one hundred grammes of meat, one hundred cubic centimetres of water, and four hundred and ten cubic centimetres of gastric juice, the secretion measured: first hour, 3.2 cubic centimetres; second hour, 5.4 cubic centimetres; third hour, 2 cubic centimetres. We thus find that the presence of free gastric juice in excess acts on the stomach as a new inhibitory reflex of the gastric secretion.

The extreme delicacy in power of detection of the stomach and at the same time the synchronous action were clearly shown by pouring into the stomach lactic and butyric acids in a proportion equivalent to a half per cent. solution of hydrochloric acid. These acids do not check the secretion, but rather increase it, and this was found to be especially true for butyric acid. When six hundred and ten cubic centimetres of the latter were introduced into the large stomach, the secretion in the small stomach measured twenty-one

cubic centimetres during the first hour and 25.5 cubic centimetres during the second. The results may be compared in a brief tabular statement, in which the quantity of liquid is six hundred and ten cubic centimetres in each case.

Hours.	Water.	0.5 per cent. HCl.	Butyric Acid, equivalent to 0.5 per cent. of HCl.
1	6.6	0.0	21.0
2	4.5	0.6	25.5
3	6.6	0.0	

The stomach is apparently able to distinguish which of several acids is presented to it. The gastric secretion is most apparent in the presence of lactic and butyric acids, which are themselves the products of fermentation.

We have so far mentioned some of the results obtained under normal physiological conditions, but we should not omit some reference to results obtained in Pavlof's laboratory under pathological conditions.

Dogs with isolated small stomachs and besides a fistula of the large stomach were taken and morbid conditions produced in either the large or the small stomach. If the diseased condition were produced in the small stomach and the separation of its secretions under normal conditions of digestion in the large stomach were observed, it is evident that they had only the action of the diseased organ. When, however, the large stomach was diseased and the observations were made upon the secretions of the small stomach, it was clear that the reflex action of the gastric mucous membrane was altered and there were evidences of generally disturbed digestion. Certain very irritating substances were placed in the small stomach, such as absolute alcohol, two-tenths per cent. solution of corrosive sublimate, ten per cent. solution of nitrate of silver, or mustard-oil emulsion; after these had been in contact with the mucous membrane for several minutes, a considerable amount of mucus was noticed, sometimes amounting to several hundred times the normal amount. During process of digestion in the larger stomach, there was only observed a flow of mucus instead of gastric juice from the small stomach. The copious flow of mucus was observed two hours after the introduction of the irritant, becoming gradually less until it ceased next day. This hypersecretion of mucus, though of brief duration and rapidly disappearing, which is

produced by intense irritants, shows the co-operative and protecting influence of the epithelium of the gastric mucous membrane. The action of the mucus is clear: it dilutes the injurious material, and also lubricates the walls of the stomach so as to protect them against the irritating effect of the substance. This phenomenon can be classed as pathological as well as physiological. The meat diet stimulated the peptic glands without disturbing the epithelium; these substances irritate the epithelium without disturbing the glands. If, however, the effort to protect the epithelium fails on account of the activity of the irritating agent, the peptic glands will necessarily suffer. When this occurs, two characteristic peculiarities are noticed. First there is increased activity of the gastric secretion, called gastrosuccorrhœa, which rapidly diminishes; this has been observed after the application of such active irritants as a ten per cent. solution of nitrate of silver. The following is a record of the gastric secretion in the small isolated stomach under normal and under pathological conditions after the ingestion of one hundred and fifty grammes of meat.

Hours.	Normal Secretion in Cubic Centimetres.	Pathological Secretion in Cubic Centimetres.
1	6.5	8.4
2	5.3	3.5
3	4.3	2.5
4	4.4	1.2
5	2.8	0.0
6	1.4	0.0
Total,	24.7	15.6

A second condition is characterized by comparatively slow functional activity of the glands, as shown by the following record, secured by the application of cold.

Hours.	Normal Secretion in Cubic Centimetres.	Pathological Secretion in Cubic Centimetres.
1	11.6	6.2
2	8.4	11.6
3	3.5	10.8
4	1.9	5.6
5	1.3	3.6
Total,	26.7	37.8

We thus find that, while in the first case the functional activity develops rapidly with more profuse secretion, it also diminishes

rapidly and the amount of secretion is less than under normal conditions; but in the second case the response is slower, the cessation of activity is delayed, and the total amount of secretion is greater than when normal conditions prevail. These are both passive conditions. A dog having a gastric ulcer of the stomach, from which it later perished, gave evidence of hypersecretion, and this increased with the progress of the disease until finally it was three or four times as great as normal.

With the appearance of hypersecretion one fact in particular is noticed, which explains the cause of the hypersecretion. This record shows the condition of secretion during the administration of bread under normal and under pathological conditions.

Hours.	Normal Secretion in Cubic Centimetres.	Pathological Secretion in Cubic Centimetres.
1	26.2	26.2
2	13.0	26.6
3	13.0	15.8

During the first hour the quantity of secretion under normal and under abnormal conditions is the same; during the second and the third hour it is much larger under pathological conditions. Remembering that the quantity of secretion during the first hour depends largely upon psychical conditions, while later it is due to chemical irritation of the mucous membrane, we see that the hypersecretion here shown does not depend upon any abnormal condition of the glands themselves, but rather is due to the altered irritation of the mucous membrane detecting the specific food.

In studying diseases of the stomach states of hyposecretion may be observed as well as those of hypersecretion. During several days succeeding the administration of an irritant to either the small or the large stomach, a decrease in the gastric secretion of the small stomach was observed, and it is clear that we have to deal with a normal reflex influence. An exception appears in the use of alcohol, the administration of which to the large stomach is followed by a copious secretion from the small one. Following irritation of the large stomach the secretion of gastric juice in the small stomach was generally diminished during the first few days, later increasing materially and becoming a compensating hypersecretion.

As a large number of dogs were constantly under observation, the necessity arose for the treatment of various diseases. The

methods of treatment of gastric diseases were based upon the knowledge of the functional activity of the glands derived from the experiments heretofore described and gave brilliant results. The well-known principle of giving the stomach rest when treating it for diseased conditions was adhered to. Having established the fact that fats and alkalies check gastric action, these were used as pharmacological remedies. With a half per cent. solution of sodium bicarbonate permanent effects were always obtained. One hundred cubic centimetres of the latter solution were also placed in the intestines with good results.

Bearing in mind the inhibiting influence of fat, this substance was also employed medicinally, but considerable care had to be exercised in its use. It will be remembered that fat placed in the stomach in small quantities checked the secretion, but when larger quantities were used there was a subsequent increase in the flow. Dr. Kasanskey gave butter, once daily, with fifty grammes of meat and two hundred grammes of bread daily to a dog, and obtained a lessened hypersecretion. Prior to the treatment one hundred grammes of meat yielded 64.7 cubic centimetres of gastric juice; after two days of treatment the secretion amounted to 34.7 cubic centimetres and two days later to only 30.7 cubic centimetres; under normal conditions there would have been a secretion of 26.7 cubic centimetres. Still further to decrease the amount, he gave butter twice a day instead of once; but after two days there was an increase instead of a decrease. Dr. Kasanskey secured excellent results by first placing in the rectum one hundred cubic centimetres of a one-half per cent. solution of sodium chloride and following this with a daily diet of from ten to fifteen grammes of butter with two hundred grammes of bread. Following the administration of the sodium chloride to the rectum the secretion in the small stomach dropped from 48.3 cubic centimetres to 20.8 cubic centimetres, and the acidity from .5 per cent. to .42 per cent.

Besides the treatment of pathological conditions with alkalies and fats as remedies, the general diet of the dogs was regulated strictly in accordance with the condition of the diseased organs. There was a purpose, for instance, in administering butter with bread instead of with meat. The curves illustrating the gastric secretion during the ingestion of various foods show that the secretion following a bread diet is diminished except during the first

hour, and we therefore expect but very limited activity on the part of the peptic glands.

If these experiments in successful therapy demonstrate the importance of careful study of the organ operated upon, this is made even more apparent in the case of dogs with cut pneumogastric nerves where life is to be preserved. Professor Pavlof and Dr. Schumof-Simanovsky have shown that psychical gastric secretion can be observed only while the gastric nerves are intact. If the pneumogastric nerves be cut, no matter how long the dog is teased with meat, and no matter how much the meat is fed to dogs who have undergone the œsophagotomy operation, no gastric secretion is obtained. Dr. Ushakoff has also shown in this laboratory that if we irritate the pneumogastric nerve with an induction current for several hours, with brief intermissions, we find gastric secretion during each period of current flow.

It is, therefore, clear, first, that the pneumogastric nerve is the secretory nerve of the peptic glands, and, second, that the psychical secretion of these glands is in response to an impulse along this nerve. The knowledge of these facts enabled Pavlof to do what others had failed to do,—keep dogs with cut pneumogastric nerves alive for a long time. As the cutting of the pneumogastric interferes with the feeding of the dog, this has to be done through the fistula in the stomach, and the question arises how this may be done to the greatest advantage. We have already seen that these dogs have no psychical secretion, and that the only secretion will result from the chemical irritation of the mucous membrane; hence we must supply gastric juice or give food that will promote active chemical secretion. The use of meat broth or Liebig's extract becomes, therefore, practically indispensable, inasmuch as no psychical secretion is present. Should we give to such a dog food which is nutritive in the ordinary sense but deficient in chemical excitants, this would merely take up room in the stomach and cause disease. We shall see in our next article that the secretion of the pancreatic juice is intimately influenced by the gastric secretion. It is, therefore, clear that the absence of gastric juice or its diminution will be reflected in the further step of digestion still more than the simple absence of gastric digestion.

(To be continued.)

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